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East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

No. 2132

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ENERGY POLICY UP TO YEAR 2000 OUTLINED

Leipzig ENERGIETECHNIK in German Vol 31 No 3, Mar 81 pp 92-98 manuscript received 15 Dec 80

/GDR contributions to 11th World Energy Conference, Munich, September 1980, by Dr Gotthard Gerisch, economist, Institute for Energy Technology/Central Office for Efficient Energy Use, Leipzig; Dr Peter Hedrich, economist, instructor, Zittau Engineering College; Prof Dr Friedrich Wilhelm Kloeppel, engineer, Leipzig Technical College; and Dr Dietmar Ufer, economist, Institute for Energy Technology/Central Office for Efficient Energy Use, Leipzig: "Planned Development of Energy Requirements Making Maximum Use of GDR's National Energy Resources"/

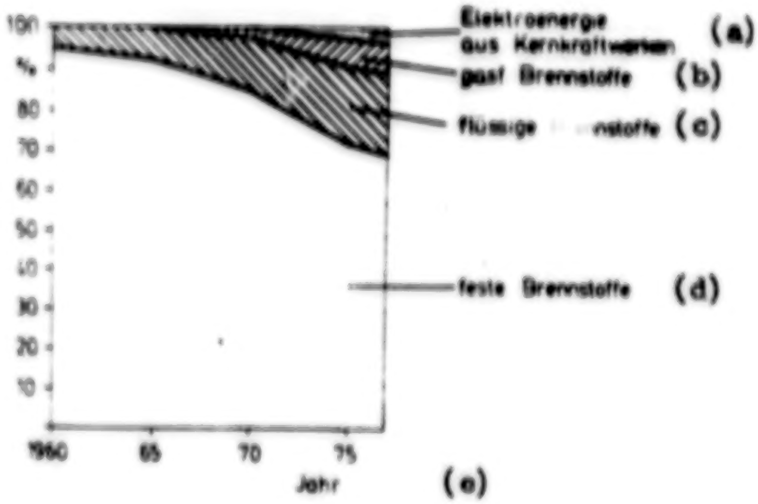
/Text/ Since the beginning of centrally planned development of the GDR's national economy in the late 1940's, systematic development of the energy economy and the continuous assurance of its supply tasks in relation to the economy as a whole have been an integral part of general economic planning work. The point of departure was the socialist economic strategy developed by Lenin, which holds that the development of a strong and modern energy and raw-materials base is a fundamental prerequisite to the building of socialism. Playing special roles in this process are the rapid expansion of electric power production and its comprehensive application as a growth factor which increases labor productivity. These findings conclude that development of the energy and raw-materials base is possible only within the framework of a planned and proportional development of the country as a whole, and that a properly proportioned supply to society of energy and raw materials is critical to the continuity, stability and effectiveness of the overall economic reproduction process as well as to full employment and the steady improvement of all the people's material and cultural standards of living.

1. GDR Energy Base

The GDR's energy economy is based on a primary energy strucutre that is unusual for industrialized countries. Brown coal accounts for nearly two-thirds of the GDR's total primary energy yield today (Fig. 1). This makes the GDR the world's largest producer of brown coal. With an annual output of around 250 million tons, it accounts for approximately 30 percent of the total volume of brown coal production. Production has thus more than doubled since the year the GDR was founded (1949).

The reason for the conspicuous preference for this energy source lies chiefly with the structure of primary energy sources. The GDR is relatively well supplied with

Figure 1. Development of Domestic Primary Energy Consumption



Key: a. Electric power from nuclear power plants

b. Gaseous fuels

c. Liquid fuels

d. Solid fuels

e. Year

brown coal but has few natural gas reserves. Industrial supplies of hard coal have been depleted, so production has meanwhile been halted.

Another reason for the significant proportion of brown coal in the primary energy yield is the fact that outlays required for production are relatively low. Specific expenditures involved in producing the coal, which is obtained exclusively from strip-mining, are lower than for all other fossil energy sources. It is thus effective to convert brown coal into other energy sources despite its low thermal value of about 8.1 megajoules per kilogram and an average moisture content of 50 percent.

Brown coal is employed in virtually all areas of energy use in the GDR. It forms the basis for the production of electric power, district heating, city gas, coke and home heating fuels as well as for the manufacture of liquid fuels and basic chemicals.

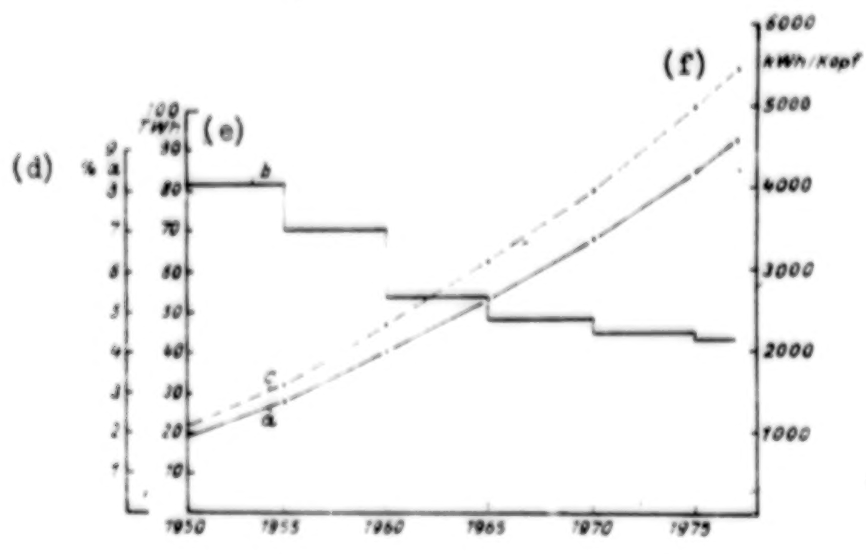
Electric power supply is an especially dynamic branch of the GDR's energy economy. Production of electric power has increased by a factor of 5.8 since 1949 and today amounts to around 100 terawatt hours per year. With per-capita consumption amounting to nearly 6,000 kilowatt hours, the GDR is thus among the leaders of all comparable countries in the world.

About 80 percent of electric power is produced today in brown-coal power plants, predominantly in blocks of 100 megawatts or more. In close cooperation with the USSR and other socialist countries, power plant blocks with a capacity of 500 megawatts have been put into operation in recent years. The capacity of the largest plant, the Boxberg Power Plant in Cottbus Bezirk, is around 3,500 megawatts.

The percentage of electric power being produced in nuclear power plants is steadily increasing. The year 1966 saw the construction, with Soviet assistance, of a 70-megawatt nuclear power station which now serves as a training and experimental power station. The Bruno Leuschner Nuclear Power Plant's first 440-megawatt block began operating in 1974 on the Baltic Sea coast. This plant, which is still undergoing expansion, now has a capacity of 1,760 megawatts.

A substantial portion of our electric power is produced in industrial and thermal power plants, with the simultaneous production of low-temperature heat for technological and space-heating purposes. Counting the coal used in heating plants, more than 60 percent of all raw brown coal is used to produce electric power and heat (Fig. 2).

Figure 2. Development of Electric Power Production



Key: a. Electric power production

b. Five-year growth rate

c. Per capita production

d. Percent per year

e. Terawatt hours

f. Kilowatt hours per capita

Our installed power-plant capacity in 1980 amounts to a total of 20,000 megawatts.

Transmission and distribution of electric power is accomplished via an associated system expanded to a voltage of 380 kilovolts, one that operates in parallel with the European socialist countries' International "Frieden" [peace] Associated System.

Approximately a third of the brown coal is made into briquettes prior to further use. These brown coal briquettes constitute a high-grade energy source for the GDR, one which is used by the people for heating their homes, for the production of heat in heating plants located far from the mines and for further processing. Nearly 50 million tons of briquettes are presently being produced annually, with a thermal value of 19.4 megajoules per kilogram.

Using a method developed in the GDR, two coking plants produce 2.2 million tons of high-temperature brown coal coke each year as well as city gas made from briquettes. Schwarz[illegible]mpe, the GDR's largest producer of city gas, is using briquettes in fixed-bed pressure gas generators. Another important area of use for briquettes is in low-temperature carbonization, the primary function of which is to derive liquid products.

The last few decades have seen the development in the GDR of an efficient associated supply system for city gas which covers the entire country. Most city gas is made from brown coal. The yield amounts to more than $6 \cdot 10^9$ cubic meters per year. A new process for obtaining gas from brown coal is being developed. Some years ago, the city gas system was supplemented by natural gases, so three gas systems are now operating in parallel in the GDR: for city gas, for domestic natural gas with a relatively low methane content and for imported natural gas with a high methane content.

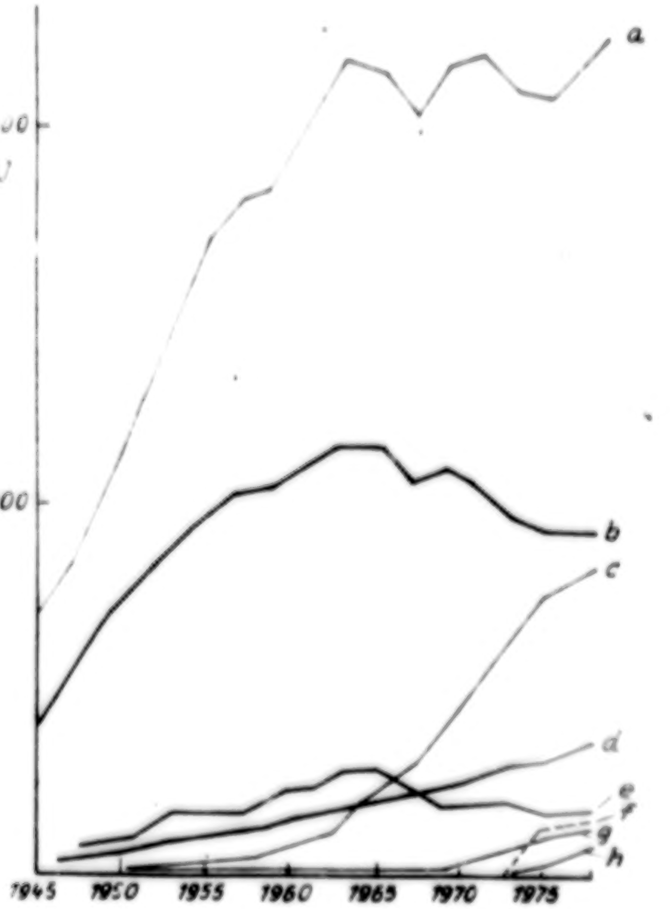
The large supplies of available brown coal, the favorable conditions for mining it and the many different possibilities for its use have allowed the GDR in recent decades to get by with a relatively low allotment of petroleum, nearly all of which has to be imported. Petroleum has been and will be used only to the extent needed for materials in the chemical industry and for the efficient production of engine fuels. Out of responsibility toward the economy, the use of lightweight fuel oils for heating individual homes has been dispensed with. Approximately 20 million tons of petroleum are presently being processed each year; this amounts to somewhat more than 20 percent of the primary energy yield, substantially less than in other industrialized countries.

The production and/or import of all energy sources has been developed according to a plan in the GDR, with the proportion of solid fuels being gradu[illegible] reduced.

The purposeful expansion of the energy economy has demanded substantial economic outlays. At times, for instance, between 30 and 40 percent of all industrial investments have gone to the energy economy. Simultaneously with the buildup of the energy base, initiatives aimed at the efficient use of energy were developed in all sectors of the economy; these measures have led to a steady decline in specific energy consumption figures in industry, agriculture, transportation and so forth.

The forward-looking investment policy, in conjunction with efforts toward the economical use of energy, has been making possible the development of industrial production, the national income and the standard of living at a decidedly faster pace than that of primary and utility energy procurement (Fig. 3).

Figure 3. Development of Important Energy Sources



Key: a. Brown coal

b. Brown coal briquettes

c. Petroleum

d. Electric power

e. Hard coal

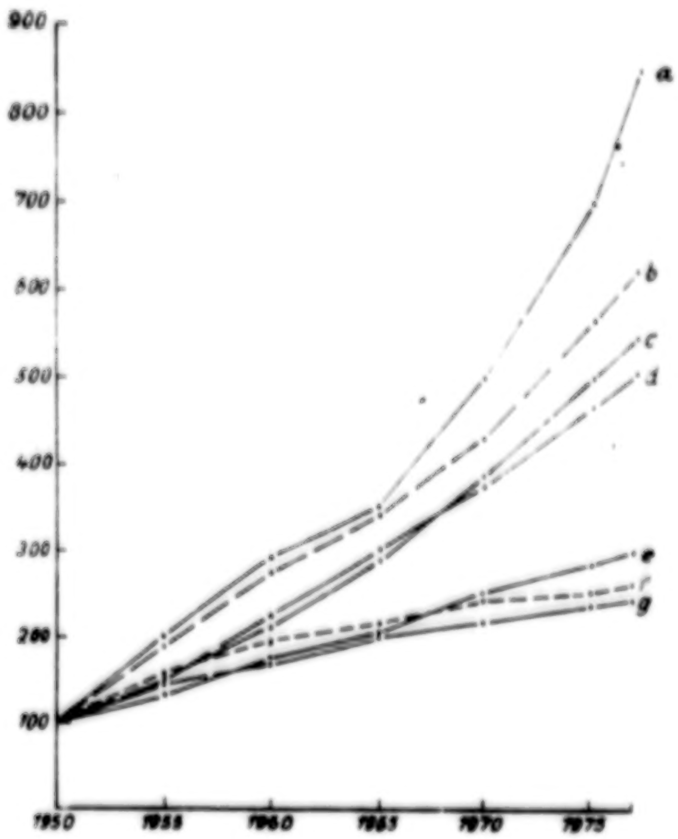
f. Imported natural gas

g. Domestic natural gas

h. Nuclear energy

For example, a 2.26-percent average annual growth rate for primary energy consumption was achieved in the period between 1960 and 1978 together with a growth rate for national income averaging 4.61 percent (Fig. 4).

Figure 4. Index of Selected Per Capita Index Figures for the National Economy and the Energy Economy



Key: a. Social consumption

b. National income

c. Gross industrial production per employee

d. Electric power production

e. Individual earned income

f. Utility energy

g. Primary energy

2. Future Development of the GDR Energy Economy

2.1. Necessity of Long-Range Planning

Systematic and purposeful work has been going on for many years in the GDR on long-range planning for the energy economy, at least one or two decades in advance in all areas. This permanent task results from socialist production conditions, under which all decisive means of production are the property of society and are used and developed for the benefit of society as a whole. Moreover, there is a special need for long-range energy planning for the following reasons:

1. The energy economy is materially interwoven with all branches of the national economy, with all spheres of social life.

2. Another reason that long-range energy planning is needed results from the energy economy's relatively great requirement for public funds for its simple and expanded reproduction. Thus, in 1976 the energy and fuels industry had at its disposal 6.3 percent of industry's manpower, 24 percent of its investments and 23.8 percent of its capital goods.

The drafting of a plan to develop the energy economy for a peri of about two decades in advance requires a highly specialized set of econom , mathematic devices in addition to strictly controlled teamwork by experts in the energy economy, the energy-consuming sectors and national economic planning and by economists and engineers. Suitable devices for gaining control over substantive and time-related interdependencies were developed in the early 1960's in the GDR.
With consideration for the different economic merits of public funds at various times, these devices permit us to record for a period of 15 to 20 years the use of existing technologies and available resources as well as the use of new technologies and the development and use of new resources as they relate to one another. A system model developed on this basis has been in use in the GDR's energy economy for more than 10 years.[1,3]

2.2. Main Lines of Development in the Energy Economy

Three fundamental problems have crystallized from studies conducted thus far on the long-range development of the energy economy in the GDR.

1. The first of such problems results from the energy economy's greater emphasis on brown coal and the attendant increase in mining outputs. The GDR economy is thereby confronted with two questions which have become clearly apparent at the present time:

Conditions for the mining of brown coal are becoming increasingly unfavorable, since mining operations in the past exploited those deposits for which production conditions were the most favorable. These fields have for the most part been cleaned out, leaving for development a greater number of smaller deposits at greater depths and with veins that are not as thick. A result is the increasing proportion of overburden that must be mined in relation to the amount of coal obtained. As recently as 1960, this overburden-to-coal ratio was 2.85; today it is more than 4 and will continue to rise. The development of mining procedures must halt the resulting cost progression insofar as possible.

Another obstacle is the fact that brown coal fields with high salt content will have to be opened up in the future. Suitable methods will have to be developed if the coal is to be used.

Closely connected with the change in the conditions for extracting brown coal is the increasing use for strip-mining of land in the densely populated GDR that is regularly farmed or forested — or has even been built up. As an expression of socialist environmental control, each year at least as much land is returned to agriculture and forestry as has been taken away; some of this land is of high quality.

In general, all of these measures involve growing expenditures for the procurement of brown coal;

Assuming the present level of production is maintained, the GDR's known industrial brown coal reserves will last for about another 100 years. Thus, the time frame for long-range planning is getting closer and closer to the point at which declining reserves will force a drop in production. Planning for brown coal production must therefore provide for adequate supplies of coal for future large users of brown coal — power plants, for example — during their entire life span, or at least 30 years; and these supplies should be located as close by as possible. Moreover, it must be taken into account that brown coal is the only carbon source available in any amount in the GDR. It therefore has to be preserved as a raw material for the chemical industry, especially in the next century when the world's natural hydrocarbons will become scarce and/or very expensive. This poses the problem of an economically advantageous configuration of the brown coal production curve.

2. The second fundamental problem has to do with scientific-technical development of the nuclear energy field. Such development has made it possible today for nuclear power plants to generate electric power with basically the same specific expenditure per kilowatt hour as conventional power plants. If the advancement of nuclear technology to the stage of power plants with fast-breeder reactors is taken into account, within the foreseeable future we shall have at our disposal a primary energy source which can be used effectively for a long time. This has the following significance for the GDR: The technical-economic level of development provides the opportunity, while the primary energy situation poses the necessity, for the increasing use of nuclear energy for purposes of electric-power and heat production.

3. The third and final basic problem derives from the price explosion for fossil fuels on the world market, as evidenced since the first half of the past decade. This circumstance must be taken into account in all national energy planning.

With these three fundamental problems — rising costs for brown coal production and the need to plan a tapering production curve; opportunity and need for introducing nuclear energy; sharp increases in world market prices for fossil energy sources — the energy economy is presently faced with a qualitatively new situation that makes it necessary to delineate anew the main directions of further development.

The main task of any energy economy consists in satisfying a developing demand for energy in a stable manner. If one were to extrapolate the current trend in the development of the GDR energy economy, the following picture would be the result:

As in the past, the demand for primary energy will continue to grow at a rate of somewhat more than 2 percent;

The GDR's own primary energy yield will remain more or less constant.

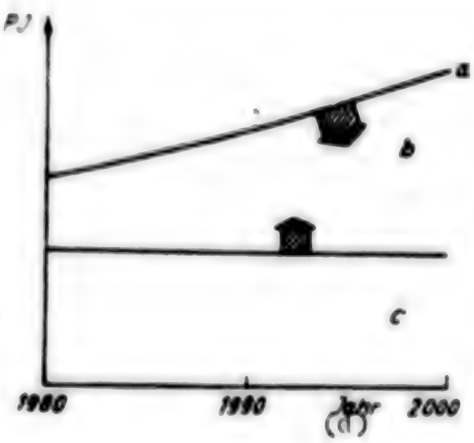
In practical terms there are three possible ways to meet future energy demands. The resulting main directions for development of the energy economy are these:

1. Increasing the yield from domestic primary energy sources;

2. Reducing the growth rate of primary energy demand, especially through the efficient and economical use of energy;

3. Growing use of additional energy sources (Fig. 5).

Figure 5. Main Directions of Development for the Energy Economy



Key: a. Primary energy requirements

b. Energy imports, including nuclear energy

c. Domestic primary energy yield

d. Year

The strategy to be selected derives from the principles of the GDR's energy policy. It will be a synthesis of the three aforementioned options as dictated by the economy as a whole.

2.3. Principles of GDR Energy Policy

The goal of the GDR's socialist energy policy, the basic features of which have proven successful for years, is to supply the economy and the public with the amounts of energy needed by society. It calls for developing the scope and structure of the energy economy in such a way that societal outlays for production and

use are kept to a minimum. This requires a mentality which quite consciously extends far beyond the economic branch of energy supply, with its coal and electricity production sectors, one which brings the entire economy into the energy-planning process along with the users of energy. At the same time, any isolated view of the development of individual energy sources — coal, gases, electric power, for example — is too constricted and would not constitute a proper basis for making the right decisions.

In line with the demands posed by the objective laws of socialist economics, and as a consequence of previous experiences with practical planning for the energy economy and its results, we may arrive at the following four basic principles of GDR energy policy:

1. Efficient employment of energy; avoidance of all waste;

2. Extensive use of domestic energy resources;

3. Continuous improvement of the energy source structure;

4. Close interdependence of the GDR energy economy with those of the other socialist countries within the framework of CEMA.

The first principle, the efficient employment of energy, concerns the use of all energy sources in all areas, including conversion as well as the direct use of energy.

Efforts toward efficient energy use have been the focus of attention in the GDR not just since the rapid price increases on the world market; rather, they result from the requirements of the law on the economy of time. In every instance prior to decisions on further expansion of the energy base, it must be determined whether the funds to be provided by the national economy might not be put to more economical use if spent on avoiding energy losses in the conversion, transport and direct use of energy. In other words, all technical possibilities for reducing losses must be exhausted to the extent that the resulting possible release of energy would require smaller — or at most the same — societal outlays than new energy supply installations would cost to provide the individual amounts of energy (of the same quality).

Despite years of work in this area, new possibilities for reducing specific energy consumption in the sectors of energy conversion and use are constantly being disclosed — not unimportant in this regard are advances in the area of scientific-technical progress; these possibilities are effective from the standpoint of the aforementioned standard. Planning for efficient energy use is consequently also one of the most important areas of planning for the GDR energy economy as a whole. Analyses performed thus far have revealed the following priorities for the efficient employment of energy:

Increases in the efficiency of energy conversion — for example, by intensifying the heat/power coupling in the production of electricity and by shutting down older installations;

Reduction of specific energy consumption in energy-intensive processes — in metallurgy and the chemical industry, for example;

Reduction in the employment of utility energy through the increased use of secondary energy — for example, waste heat from high-temperature processes for use in district heating; condenser heat from briquette factories for the heating of greenhouses; thermal power plant coolants for use in pisciculture;

Reduction of the specific heat requirement for space heating, especially via better building insulation and proper temperature regulation;

Improvement of the energy efficiency of processes through the application of advanced and new reaction principles — in illumination technology or the construction of industrial furnaces, for example;

Implementation of efficient energy-use options for nonindustrial consumers — through railroad electrification and the quality of electrical appliances, for example.

The incorporation of efficient energy use in energy planning means viewing the needs of energy users not as a predetermined, fixed entity, but rather as something variable and capable of being influenced. Virtually all energy-use processes are being subjected to critical review from the standpoint of the energy economy and are being reduced — in the interest of the economy as a whole — thus permitting an active influence on utility energy requirements. In this regard, clarification is also being sought on whether it is more beneficial to the national economy to use investments and/or scientific-technical measures to preclude some of the demand for energy, or whether it is more efficient to spend a corresponding amount to provide utility energy. These considerations extend far into national economic structural policy, which can obviously be influenced only over the long term.

The second energy policy principle calls for development of the GDR's energy base with extensive use of its own energy resources. Since domestic sources of hard coal, water power and petroleum are virtually nonexistent, and only small amounts of domestic natural gas are available, it is a matter of establishing all the necessary conditions for increasing the production of brown coal, still a very advantageous source of energy in terms of costs. The following measures are included here:

Continuation of geological explorations to discover new deposits that are worth mining;

Development of mining technologies for small and deep veins, thus permitting an increase in the proportion of industrial — or economically usable — reserves as a percentage of geological reserves; support for this development comes from the increased prices for primary energy that are expected to continue in the future on the world market;

Development of procedures for making use of brown coal containing salt — to produce steam or to obtain by-products, for example; this would make it possible to put this brown coal to use as well, since it accounts for about 10 percent of the reserves.

Thus, the extensive use of domestic energy resources means producing steam and hot water predominantly with brown coal as a base. The use of imported gas or fuel oil for these purposes is to be limited to exceptional cases.

Among the domestic energy resources are the so-called regenerative energy sources, which have heretofore largely gone unused. Considering the GDR's specific geographic conditions, these are solar energy, geothermal energy and wind energy. Detailed technical and economical calculations have revealed that their contribution toward coverage of the GDR's primary energy requirements up to the turn of the century would probably be on the order of 1 percent at the most. And they can be expected to be used only for quite specialized purposes — solar energy in providing hot water for agricultural purposes and geothermal energy for greenhouse heating, for example.

The third principle of energy policy calls for continuous improvement of the energy structure — the primary energy structure as well as that of utility energy. Improvement of these structures means the increased use of those energy sources which can be used to reduce societal outlays for the production and use of energy.

Heading the list in the area of energy conversion is the use of nuclear energy to produce electric power, and heat in the future. Nuclear energy constitutes an energy source which can be used to provide cheaper utility energy over the long term than that derived from fossil sources of primary energy; moreover, it is virtually unlimited in quantity as well as environmentally sound and safe.

As shown in Fig. 1, recent years have seen a tangible increase in the share of liquid and gaseous fuels in the primary energy yield, with a corresponding decline for brown coal. In the long run, the shares of petroleum and natural gas will go down again. These sources of energy thus cannot make any contribution to coverage of primary energy growth. This is related to the gradual dwindling of natural hydrocarbon reserves and the international price trend for these energy sources.

At the level of direct energy use, electric power is the only energy source which has for decades been registering a steady increase in its share of the utility energy balance and will continue to do so in the decades ahead. At least until the year 2,000, the electric power yield will grow more rapidly than the overall utility energy yield. Despite the high cost to society, the growing supply of electric power is an indispensable prerequisite for the rationalization of energy use processes and for improved working and living conditions. Moreover, the increasing use of electric power helps protect the environment. This anticipated future leading role for electric power is due not only to its universality in the area of conversion to all forms of usable energy, the ease with which it can be controlled and its favorable impact on the environment; it is due above all to the fact that, thanks to nuclear energy, electric power is the only essential source of utility energy which will pose no long-range problems for the procurement of primary energy.

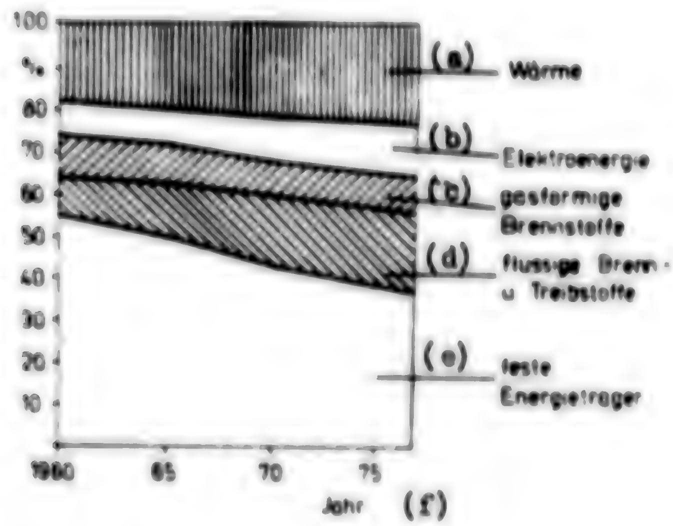
Liquid and gaseous energy sources are to be employed chiefly in areas where substitutes can either not be made or would be very expensive. They must thus be used mainly in the chemical industry as materials, in the transportation sector and in selected high-temperature processes.

District heating must be used more to cover the demand for low-temperature heat. In this regard, district heating produced from brown coal costs about 50 percent less than that produced from fuel oil. Intensification of the GDR's traditional heat/power coupling will increase the efficiency, and thus the economic

effectiveness, of both heat and electric-power procurement. It will also be necessary in the future to put nuclear energy to use as a new primary energy base for supplying heat.

On the whole, the trends evident in Fig. 6 (utility energy structure) — an increasing share for electric power and a declining share for solid fuels — will continue.

Figure 6. Development of Utility Energy Requirements



Key:
- a. Heat
- b. Electric power
- c. Gaseous fuels
- d. Liquid engine fuels and fuels
- e. Solid energy sources
- f. Year

The fourth energy policy principle is virtually identical to one that underlies economic policy in general: increasingly closer economic interdependence with the other socialist countries — the USSR in particular — within the frameowrk of CEMA.

This process is most conspicuous in the area of GDR primary energy procurement via imports of petroleum, natural gas, hard coal and nuclear fission materials from the Soviet Union. Cooperation by thesocialist countries in assuring the electric power supply under the "Frieden" Associated System helps stabilize supply as well as reduce costs substantially.

Another area of international socialist cooperation has to do with the construction of energy installations. In this regard we mention only the import from the USSR of the principal equipment for power plants.

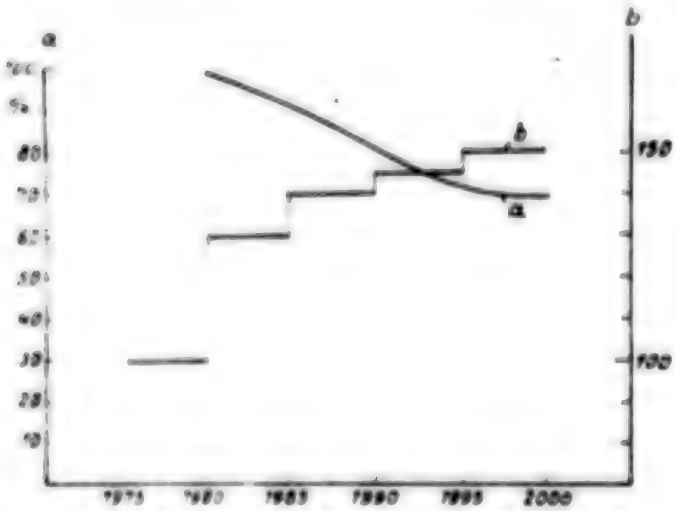
At bilateral and multilateral levels, CEMA is forcing the pace of scientific-technical cooperation on the development of new processes and technologies.

Of fundamental importance in the years and decades just ahead is the continued expansion of joint energy planning, not only for long-range coordination of reciprocal delivery of energy sources and energy-related equipment, but also for the purpose of streamlining the production structures of energy-intensive products in the individual socialist countries.

Application of the energy policy principles has produced a strategy for future development of the energy economy which can be summed up as follows:

1. Heavy concentration on efficient energy use. Calculations have revealed that, from the standpoint of the economy as a whole, it costs only half as much to save energy through efficient use as it does to produce additional energy sources. The plan for the future is therefore to lower the ratio between utility energy and national income — in other words, to decrease utility energy intensity in relation to the national income (Fig. 7).

Figure 7. Development of the Effectiveness of Utility Energy Use



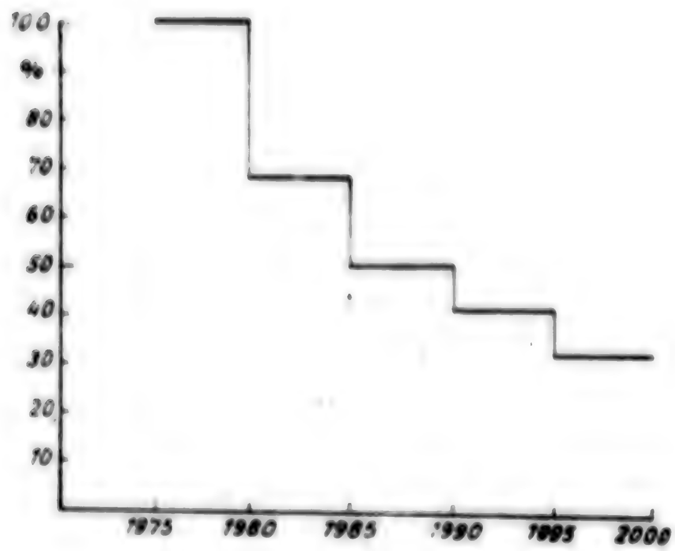
Key: a. Index of utility energy intensity

b. Index of the quotient of national income growth and utility energy growth

This will make it possible to produce the GDR's continuously growing national income while effecting declining growth rates for utility energy.

Thus, the growth rate for primary energy requirements can be distinctly below 2 percent per year in the future and continue to show a decline (Fig. 8).

Figure 8. Development of Utility Energy Growth

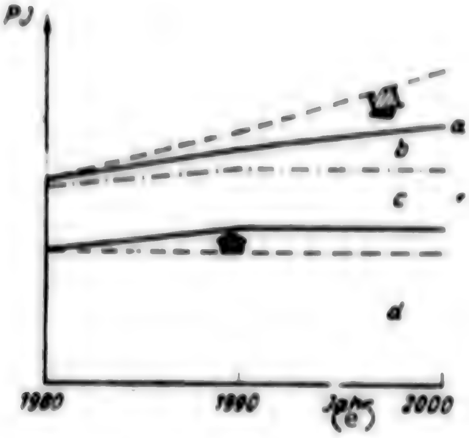


2. In accordance with the plan, brown coal production is to be increased by about 20 percent by 1990, to a volume of 300 million tons per year. Considering the field structure of the deposits, the predictable level of development of mining equipment and a tapering production curve that is to be plotted, this level of production appears today to be an upper limit.

3. The plan is for nuclear energy to cover a steadily increasing proportion of primary energy requirements. This proportion amounts to 2 percent today. Before the turn of the century, nuclear energy will accountfor all increases in primary energy; after that point it will also have to cover the declining yield of fossil energy sources. [illegible]chnical development in the nuclear energy field runs from the nuclear power plants presently operating with 440-megawatt pressurized water reactors to those with 1,000-megawatt pressurized water reactors. This type of power plant probably represents the final stage of development for the thermal reactor in the GDR. As is planned internationally as well, it will be followed by the fast-breeder reactor. And finally, the GDR is participating in basic research in the USSR in preparation for the nuclear fusion technique.

The energy economy strategy described here reveals that, practically speaking, all three of the main lines of development aimed at meeting primary energy requirements, as set forth in part 2.2 above, are being realized. Fig. 9 represents an attempt to show more concretely the main trends depicted in Fig. 5.

Figure 6. Potential Structural Development of Primary Energy in the GDR



Key: a. Reduced primary energy demand

b. Nuclear energy

c. Import of fossil energy sources

d. Increased domestic yield of primary energy

e. Year

3. Implementation of the Energy Strategy

The strategy for development of the energy economy, arrived at within the framework of long-range planning and approved by the government and party leadership of the GDR, constitutes an important foundation to be used in formulating the five-year plans for development of the national economy; these in turn represent points of departure for specific annual economic plans. In this way the strategy developed in the interests of society in general is to be implemented with the authority of the state.

On the basis of society's ownership of the means of production, implementation of the state's energy policy will receive effective support as a result of incorporating the efforts of everyone in the country; indeed, it will not become fully viable until this is accomplished. Organized innovator work and competitions conducted by the working people in the enterprises are two ways of beinging this about. Major results for energy conservation will thereby be sought and achieved. Effective stimulation in material form will encourage this process. The mass media — television, press, radio — will be calling upon all the people to help use energy efficiently and to avoid waste.

It can be said in conclusion that implementation of the energy strategy developed by the GDR will assure over the long term a stable and secure supply of energy for the people and all sectors of the economy.

FOOTNOTES

1. Hedrich, P., "Models for Management of Energy/Environment Systems. I. The German Democratic Republic, I. A — A Description of the Models." International Institute for Applied Systems, analysis: "Management of Energy/Environment System. Methods and Case Studies," edited by Wesley K. Foell, 1979, pp 406-415.

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RATE OF EXCHANGE POLICY, PRICE MECHANISM DISCUSSED

Budapest KULGAZDASAG in Hungarian No 2, Feb 81 pp 17-23

[Article by Janos Deak: "Exchange Rate Policy and Price Mechanism"]

[Text] Various, and often contradictory, views regarding the development of a correct exchange rate policy have reached the reader in numerous papers, debates and articles, including the columns of this magazine as well. (As an example, we can cite the articles of Gabor Oblath and Lajos Osvath in the 1980/10 and 1980/12 issues.) The author of this article opposes pegging the exchange rate to the changes in export and import prices. In his opinion, the exchange rate policy and the forint's de- or revaluation must continue to depend on the index of exchange earnings, i.e., on the fluctuation nationally in domestic input necessary to acquire one unit of foreign currency for exports. The exchange rate policy is not the only and exclusive weapon with which to fight inflation. All means which make it possible in the given situation to avoid the effects of external inflation must be utilized. An exchange rate policy built on export efficiency can be a good basis for achieving the balance requirements and a permanent and steady interest in exports.

The general goals of the exchange rate policy are set by high-level resolutions. In making the exchange rate policy, the goals of the middle-range plan, the necessity of fighting inflation and the requirements of external balance must be considered. Policy decisions must be based on these views, on a careful study of external and internal factors, and on calculations.

The operating principles of the pricing system and pricing mechanism were modified in 1980 and thus there was only a short time available for us to gain experience. It is nonetheless a sensible thing to have an overview of the relationship between the exchange rate policy, the price system and price mechanism and the supplementary financial means, nor to lose sight of the new circumstances, requirements and principles.

External Inflation and the Exchange Rate Policy

The relationship between the exchange rate policy and domestic prices had already been formulated even before the price explosion on the world market. What happened basically in the past years was that the producer prices were slow in following the world market prices, and in the meantime it was the budget that was burdened in a relatively wide area of fixed and maximized prices with costs arising from the differences between external and internal prices.

Already in that period, the modification of the exchange rate in the economic processes depended on the goal of alleviating the pressure on producer and consumer prices originating from the steadily increasing prices of semi-finished products, even if the domestic cost of export efficiency and a unit of foreign currency did not change to the same degree.

It seems that the 1 January 1980 pricing system and price mechanism which is pegged to foreign trade prices, and the closely connected subsidy system, that in practice there is a more imminent danger of inflation resulting directly from a closer relationship between external and internal prices. This is what Matyas Timar pointed out in his article, "Our Exchange Rate System in a New World Economic Situation," which appeared in the 1980/7 issue of PENZUGYI SZEMLE (Financial Review:) "External Inflation Affects Our Domestic Prices through the increase of exchange rates in our direct exports and imports. Our exchange rate policy must initially be based on the relationship between our domestic producer prices and the increase of exchange rates in our exports and imports. Export-import exchange rate must not be defined primarily as the rates of exchange in exports and imports which have actually taken place, i.e., which have been brought in, or taken out of, the country. In following only these, we would condemn ourselves to passivity. Our exchange rate policy, which is protecting the domestic prices and which forces us to be more efficient, must put more emphasis on export-import prices; in case of a policy which follows the prices changes, the rates change by the time of actual payment and thus the increasing rates of exchange increase the domestic prices and costs to a lesser degree and leave no, or little, inflational profit for the exporters. This is how we can achieve relatively stable domestic producer prices in an inflationary world economic environment."

The necessity of the following more important policy changes can be deduced from this evaluation: 1. Since the danger of inflation emerges through export and import prices, a sensible measure of protection would be to make our exchange rate policy dependent not of the improvement in export efficiency but of the changes of export-import rates of exchange. 2. In changing the rates of exchange, the basis should be the export-import rates of exchange attainable for the coming period.

Let us look more closely at the questions that arise when evaluating the rightness and necessity of these changes.

Dampened Effect

First, we must answer the question whether pricing and price mechanism based on foreign trade prices, and the specific subsidy system increase the pressure of inflation which emerges through export and import prices.

The increase in export-import exchange rates affects in domestic prices increases. This effect is dampened, however, even with no change in the rate of exchange, for the following reasons:

- In the pricing system pegged to foreign trade prices, the prices affect a sector of raw material and semi-finished product consumers by the exchange rates for imported goods. Prices in this sector increase even in case export efficiency

decreases. It is clear, however, that strongly limiting even with no change in exchange rates, so that consumer prices are not effected by the changes of producer prices based on hard currency rates.

- About 80 percent of our total imports reach the consumer or final user through production. The final user gets 20 percent of the unprocessed imports directly. Price increases of raw materials and semi-finished products have their final effect in the processing branches. When the increase of export prices does not follow these prices proportionately, the processing industry's profits will decrease in both domestic and foreign sales. The producers of raw materials and semi-finished products must decide whether a price increase affects their capacity utilization and thus they are forced to set their prices according to supply and demand. As a result, the price of raw materials and semi-finished products have a more dampened effect on general prices than the changes exchange rates would make it possible.

- In general, price changes of processed products follow the price increases of raw materials and semi-finished products much later and without proportion.

- It is also clear that until we achieve a permanent improvement in the foreign terms of trade, the increase of domestic enterprise producer prices pegged to foreign trade prices may be more moderate, even without any change in the exchange rate, than the foreign exchange rate changes. It was already apparent in 1980 that supply and demand were considered, and prices were not increased even in large-volume, modern products (e.g., that of PVC).

- The value added by the producers of raw materials and semi-finished products does not increase in proportion to import costs. Because under normal conditions, a steady activity in itself, results in an increase of efficiency. This must have a moderating effect on prices, or we must accept that the profits of raw materials and semi-finished producers will increase dynamically and steadily, to the disadvantage of the processing industry.

- The producers of finished products follow a pricing which is proportionate to exports. There is a double limitation here in increasing domestic prices. The change of domestic prices depends on the change in the exchange rates of exported goods and on export profits. An enterprise can increase, without a change in the rate of exchange, domestic prices in proportion to the change of export prices only if its profits have not decreased and its costs have not increased, because profits decrease in proportion to cost increases, and the enterprise is in no position to increase domestic prices in proportion to the increase in the rate of exchange.

- A significant number of enterprises started using preferential domestic prices on 1 January 1980. They must reduce preferential prices within a specified time period, which means that their domestic prices probably will not be increased for a few years.

- International experience does not corroborate that an increase in either export and import prices has a directly inflationary effect. Countries which achieve low increases in export prices are struggling with high rates of inflation, and in countries where much higher export prices are achieved, the rate of inflation is low.

Many people think that it is possible to use the change in the exchange rates originating from export and import prices, to synchronize and control the movement of producer and consumer prices. This practice leads to a steady reorganization of the subsidy system, because a change in the exchange rate disregards increased costs. The difference between the cost of export production and the exchange rate increases. In this case the costs for consumers of more imported goods unduly decreases, and the proportion between prices unduly changes; this will increasingly affect consumer prices and supply and demand: it has an adverse effect on rational consumption. The pressure on the trade balance is shifted to lower domestic prices.

Attention must be called to the fact that developed industrial countries have many ways to fight inflation, and that the de- or revaluation of foreign currencies is based on market evaluation. The rate of exchange is not determined arbitrarily: it affects the de- or revaluation of a foreign currency through economic processes affected by government and economic policy, depending on priorities: whether it is to fight inflation or to increase economic growth. In the monetary system of the developed industrial countries, the economy's flexibility and export potentials are affected by the credit and interest policies, tax policies and the kind and degree of government intervention.

At present, an active exchange rate policy is considered as the almost exclusive means to fight inflation, and not enough attention is paid to other means which are just as effective. I consider the price regulating role of net profit as such a means. Our tax policies could also contribute to fight inflation; the lowering of linear taxes decreases prices the same way as a change in the exchange rate does. An important means to fight inflation may be the system of "lump-sum repayment of differential producer's sales tax." The payment of differential producer's sales tax of successive production phases by producers of raw materials and semi-finished products increases prices. Linear repayment based on domestic sales has a moderating effect on prices without weakening in the calculation of products the function of evaluation at world market prices. These and similar means must also be used against inflation, instead of using only an active exchange rate policy as an only solution.

In summary: in the pricing system tied to foreign trade prices, the export-import exchange rates are manifest in price proportions and levels, and they are what the changes in domestic prices depend on. This does not, however, entail a change in producer prices which parallel export-import exchange rates.

The Role of Export Efficiency in the Exchange Rate Policy

It is also a contestable statement that, in the pricing system which consistently follows external market price movements, the movements of domestic prices are governed by foreign market prices, expressed even by changes in export efficiency, and thus we can do away with the employment of an exchange rate which depends on the changes in export efficiency.

In my judgement, the exchange rate policy must continue to depend on the changes in export efficiency for the following reasons:

- I have already mentioned that the changes in foreign and domestic prices cannot ever be the same.

- The pricing system pegged to foreign prices involves 40 percent of social output. The pricing principle of proportionate expenditures is used for 60 percent of the products. The prices of products in this category are not directly determined by changes in export-import prices, thus the degree of international competitiveness, and the possibility of changing the exchange rate, can be measured on the basis of changes in export efficiency.

- The processing industry's pricing system which follows foreign trade prices, the domestic and export prices are not the same for a significant part of the producers. The difference between the two prices must be narrowed within 5 years. The possibility of this was given to the enterprises. It is not true, with reference to the enterprises in this category either, that the effect of the changes in export-import exchange rates is paralleled by changes in domestic prices. The improvement of export efficiency, at these enterprises too, is the basis of the exchange rate policy.

The starting point of the exchange rate policy that follows the changes in export-import prices is to make the de- or revaluation of the forint dependent on the price changes in the world economy and world trade. The Hungarian production and export structure (import composition) is significantly different from that used in world trade: it is much more disadvantageous. This is also apparent in the level and structure of expenditures. The measurement made on the basis of export efficiency takes this into consideration but the exchange rate policy, dependent on the changes in export-import prices, entirely excludes it from consideration.

The change of foreign currency values on the money market is not determined by export-import prices, not even in the case of countries with convertible currencies, but by the country's general economic situation. Trade balance is the speed-up or slow-down of export capacity. This, however, depends entirely on internal economic conditions, and there are innumerable international examples to show that an inadequate increase of export capacity (paralleling increasing export and import prices) entails a change in the value of the foreign currency.

The exchange rate policy which is made dependent exclusively on the changes of export and import prices, and the change of exchange rates which is proportionate to the price changes, do not take into consideration the effort to achieve an economic balance, for they mean a revaluation of the exchange rates in proportion to the increase of external prices, and do not reckon with the processes taking place in the national economy. They expect that the Hungarian economy's producers are able to work steadily and permanently at the level of general international production requirements. This does not seem to be, however, a realistic requisite.

Export Motivation and the Exchange Rate

In both past and present evaluations of the exchange rate policies, we find that future proposals are made, without consideration for factors of Hungarian economic policies.

In the 1970's, after the price explosion on the world market, the exchange rate policy was implemented to conform to the goals of economic policy. We maintained a relatively fast rate of economic growth, domestic demand increased significantly, while efficiency improved at a slower pace. The adjustment of domestic prices to foreign market prices was retarded and incomplete, and producers were, for a time, free of the burdens of import expenses.

This had the following effects: we mitigated the expected increase of producer prices (it was characteristic of the period that our import prices increased faster than our export prices), we were unable to rapidly increase our exports, and our foreign market balance became worse and worse. To say that the forint was not adequately revaluated under such conditions is not realistic. An undervalued forint cannot exist, because the commercial rate of exchange did not cover most of the export expenses. An example of this was the calculation which compared other countries' wholesale price indexes with Hungarian industrial producer prices, and tried to conclude the undervaluation of forint.

One of the main arguments of those who support an exchange rate policy which is dependent on the changes of export and import prices is that export motivation does not depend on the rate of exchange, because exporting capacities are not effected by the rate of exchange or subsidies.

There was a period in the Hungarian economy when domestic consumption was more than national revenues, and thus we elicited such a domestic demand on the domestic market which could be satisfied only by rapidly increasing imports. Under such economic conditions, it is more beneficial to meet domestic demand than to turn toward markets with higher requirements; the domestic market also provides high revenues. In such cases, the domestic market is usually preferred when a market is being selected. The economic policies of the past two years, however, changed the conditions for growth, and the moderation and levelling-off of domestic consumption is approaching the situation in which the flexibility of exporting capacities is increasing despite a stagnating or moderately increasing production. In such a situation, the use of exporting capacities depends exclusively on how long this is made possible by the exchange rate and subsidies.

It should not be ignored that the moderation of domestic demand frees, or makes little use of, capacities which were not regularly used for exports. For these, too, the only possibility is to organize production for exports. To do this, technology, methods, new products and services, and the exploration of new markets are needed. The use of these export capacities depends on the exchange rate and the use of subsidies, or necessary external requisites must be created. The general conclusion of all this is that the exchange rate policy should not be implemented according to a schematic projection of past experiences.

A Few Conclusions

I generally do not consider it expedient for us to have an exchange rate policy which is dependent on export and import prices, and I consider especially disadvantageous the proposal that the de- or revaluation of a foreign currency should be made not on the basis of a past period but on the basis of the expected changes in restrictions and prices.

The use of such a system to determine the exchange rate is justified with the argument that, if this is not done, and domestic prices are not increased, then the exporter would gain inflationary profits. I will not repeat the things discussed at the beginning of this article, namely, that domestic price changes are not proportionate to the changes in foreign exchange rates and that this is true with regard to both competitive prices and those employing proportions of expenditures. We are justified, however, in examining the possibilities exporters have to gain "inflationary price profits."

The first thing that must be discussed is whether export price increases can be considered as inflationary. Market supply and demand is different every year for various categories of products and, consequently, export price changes are also different. Hopefully, more and more of our exporters will adjust to the international requirements of production and to the market demand, and the prices will increase as a result of better work. It is beyond debate that there is also an inflationary price increase, but it is impossible to make a distinction. It is certain, however, that it is also unacceptable to consider all price increases as inflationary.

Even if we start from the premise that all price increases are inflationary, we must disagree with the use of the method. The highest prices cannot be determined in the individual countries on the basis of the inflation rate in the importing country. The inflationary process, and its acceleration in the given country changes the value of the national currency on the money market and the sale price in the importing country may be higher with relation to other currencies. However, this is not a process that takes place during the 3 to 6 months restriction period. It takes more time: 1 to 2 years. (For Hungarian exports, the proportion of products with long production periods is a mere 3 to 5 percent.) For this reason, there is no tendency of inflationary profits between the time of restriction and implementation, and if I nonetheless decrease the exchange rate, then I am "making a requirement," I decrease export motivation and take away a significant part of the possible export profits.

The exchange rate policy which is based on the changes of restricted export and import prices or on forecasts of exchange rates puts the exporters at a disadvantage and gives an advantage to all those who use significant amounts of imported products. The exchange rate is adjusted before the exports take place. It cannot be ignored that restricted prices and actual prices are frequently different and that the expected exchange rate differs from the actual price according to the characteristics of the prognosis. Under such an exchange rate policy, the exporter will not sell those products (or will sell them on other markets) which can only be sold at lower prices than the restricted or projected prices, because he does not want to lower his export efficiency.

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SALE OF IKARUS BUSES TO U.S. DESCRIBED

Budapest MAGYAR NEMZET in Hungarian 19 Feb 81 p 3

[Statements by J. Courtemanche, president of the U.S. Crown Coach Company and Dr. Sandor Szego, trade director of Ikarus given to MAGYAR NEMZET after business meeting of Crown Coach Co, Ikarus and MOGURT in Budapest 18 Feb 81]

[Text] The Hungarian articulated buses found a new market in 1981: they will be used in three U.S. cities: in Louisville, Portland and San Mateo. The order for 112 vehicles, after a hard competition, went to Ikarus and MOGURT [MOGURT Foreign Trade Enterprise for Motor Vehicles]. Their American partner is one of the largest U.S. concerns, the Crown Coach Co. Its president, J. Courtemanche yesterday met in Budapest with executives of the two Hungarian enterprises and after the business meeting gave a brief statement to MAGYAR NEMZET.

"On the basis of our joint work to date, I can say with confidence that Ikarus and MOGURT will prove to be dependable partners. The essence of our cooperative agreement is that American firms will manufacture the articulated bus engine, transmission, rear axle, seats and the special glass; the frame, the body and everything else will be made by Ikarus. Thus we will share the value of each vehicle roughly 50 - 50 percent. The assembly will be done in Budapest. We are satisfied with the first vehicles that have been assembled under this agreement, and thus we anticipate to jointly manufacture and sell 200 articulated buses by 1982. This number can increase, however. American cities are facing more and more problems in mass transit, and we hope that the proliferation of the articulated bus will alleviate some of these problems. Washington, Denver and a dozen other cities are planning to announce competitive conferences, and we will take part in them together with Ikarus. If we get the contracts, it would be feasible to sell 300 to 400 articulated buses annually."

Says Dr. Sandor Szego, the Ikarus' director of trade:

"It has been several years now that we organized a demonstration tour with the first Ikarus bus in Los Angeles and other large California cities. It won the approval of both the public and the specialists. After many meetings, a satisfactory agreement was finally reached by both parties. Requirements were strict (the Americans were asking for vehicles 18 meters long and 2.6 meters wide; the dimensions of the presently manufactured vehicles are 16.5 and 2.5 meters, respectively), also very strict technical and environmental specifications were called for. In view of our annual production of 3,000 articulated

buses, the figures 100 or 200 are not large. The world's total bus production is 1,500. A relatively good price and the new market counterbalances, however, the extra costs of retooling and redesigning and servicing. The firms which are connected with us and with Crown Coach maintain a service network throughout the U.S., and thus consumer service and repairs under warranty will not cause special problems. Incidentally, the new bus has air-conditioning, a special elevator for the handicapped, and a larger engine. Its assembly and production will be beneficial for us, because, among other things, the manufacture of a more up-to-date model will require us to meet higher standards and encourage us to learn more. These will be needed indeed: our success with the American order elicited the interest of world companies in the US market. To get new contracts, we will have to compete with Leyland, M.A.N. and others.

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ROMANIA

RELATIONS WITH SOCIALIST COUNTRIES IN CEMA DISCUSSED

Bucharest REVISTA ROMANA DE STUDII INTERNATIONALE in Romanian No 2 (Mar-Apr)81 pp 139-146

[Article by Victor Babiuc]

[Text] 1. The development of economic relations with the CEMA socialist countries, with all the socialist countries, is a priority factor in the economic foreign policy of the Socialist Republic of Romania, based not only on political considerations, stemming from their common fundamental goals, but also from objective economic factors. It is a course confirmed by the country's constitution (Article 14) and reaffirmed by Law No 1/1971 on the activity of foreign trade, of economic and scientific-technical cooperation of the Socialist Republic of Romania, according to which "The foreign trade of the Socialist Republic of Romania develops in conformance with the party and state policy on the expansion of the foreign economic relations with the CEMA member countries, with all the socialist countries and with the other countries of the world, regardless of their social-political system, based on respect for national sovereignty and independence, equal rights and mutual benefit, noninterference in domestic affairs" (Article 1). It is a constant economic policy of socialist Romania, reasserted at the time of the 12th Congress of the Romanian Communist Party, when it was stated that "Romania will further expand its economic relations with the CEMA member states, with all the socialist countries, with these being expected to account for about 48 percent in our foreign trade." [1] This guideline also emanates from the Romanian Communist Party's Program, which states that the expansion of the exchange of material assets among CEMA socialist countries "is a paramount factor in accelerating the overall progress of each individual socialist country, in putting to use their resources and potentialities and, implicitly, in reinforcing the forces of socialism as a whole." These relations "must result in the progress of each national economy, in evening the levels of development of all the socialist countries." [2] Moreover, these are goals that were set by the member countries also in the Statute for Organization and Operation of CEMA (Article 1, Item 1).

2. For development the international economic relations need legal certitude and security, and only the law can provide this. But one of the contradictions of international economic relations nowadays is that between

the international character of these relations and the national character of the applicable legal provisions, as if it was a matter of internal relations, with inherent law conflicts and incertitudes which involve as many obstacles in their development. For the purpose of doing away with these contradictions in the trade relations among the socialist countries in CEMA -- and considering that other attempts made internationally, such as uniformization of conflictual standards and of commercial practices or designation of the applicable law (lex contractus) at the point of establishing the legal relation, were not capable of always ensuring the legal certitude and security needed for expanding world economic trade and cooperation -- the efforts of the CEMA countries have focused on uniformization of the regulations meant to govern these relations. To this effect, for the selling-buying contract -- the principal legal instrument for trade among countries and nations -- formulated were General Requirements for Delivery CEMA 1968 [3] which, upon the recommendation of the CEMA Permanent Commission for Cooperation in Foreign Trade, were accepted (adopted) by CEMA countries. Moreover, for assembly and other technical services pertaining to delivery of machines and installations and for technical servicing of machines, outfits and other products, there were formulated General Requirements for Assembly CEMA 1962 and General Requirements for Technical Servicing CEMA 1962, adopted upon the recommendation of the same permanent commission by CEMA member countries. This helped to eliminate the difficulties that resulted from the diversity of the potentially applicable regulations and establish regulations corresponding to the needs of economic cooperation, which ensure a status of legal equality to all the participants in the legal relations involved. Furthermore, it facilitates the use of the benefits of participation in the international division of labor and expansion of economic exchanges, in the context of rigid implementation of the legal principles that underlie these relations.

In accordance with the tasks that emanate from the Complex Program adopted at the 25th CEMA session [1971], which stipulates significant goals in the area of upgrading the legal bases of economic and scientific-technical cooperation, and in light of the practice of foreign trade organizations of the socialist countries in CEMA, the three General Requirements were examined and improved as to reinforcing the security of these relations and enhancing the patrimonial liability of the parties. Consequently, 1 January 1973 saw the enforcement of the General Requirements for Delivery CEMA 1973 [4] and the General Requirements for Technical Servicing CEMA 1973 [5], and the General Requirements for Delivery were supplemented with some provisions on material liability for nonfulfillment or unsatisfactory fulfillment of obligations (that took effect on 1 January 1975 under the designation of General Requirements for Delivery CEMA 1968/75 and 1 Jan 1980 respectively [6].

3. As indicated, acceptance of these General Requirements by the CEMA countries was based on recommendations of the CEMA Permanent Commission for Cooperation in Foreign Trade. The existence of these recommendation generated the view that there is a kind of international agreement, as the General Requirements involved were adopted by a CEMA body which includes foreign trade ministers of CEMA countries [7]. With good reason, the view was criticized, because the issue of documents adopted by a body of an international organization and the formation of the will of that body is mistaken for the issue of

conclusion of an international treaty, as an act of will of the states. Likewise, theoretically the issue has remained open, and there is no uniform point of view in regard to the legal character of these General Requirements, because even the legal nature of the recommendations continues to be debated, with the opinions ranging from considering them a variety of international agreements [8] (in a simplified form), which develop at the point when the states concerned report acceptance of the recommendations to the CEMA Secretariat [9], to considering them simple recommendations [10].

It is indisputable that the recommendations constitute the major category of legal documents of CEMA bodies, which are adopted on the matter of economic and scientific-technical cooperation with the accord of all the countries concerned. Acceptance of these recommendations and their implementation, however, proceeds on the basis of of the decision of governments or other proper bodies in the countries involved, decisions adopted in compliance with the legal provisions in the countries concerned. In themselves, the recommendations do not create rights and obligations among CEMA member countries that declared their interest. Nevertheless, the adoption of a recommendation creates some obligations for the countries concerned vis-a-vis the body that adopted the recommendation, such as the obligation to submit the recommendation to the proper state bodies in the countries involved, for examination and adoption, and to inform the CEMA Secretariat, within 60 days, about the results of the examination. Because they generate these obligations it was considered that the recommendations of CEMA bodies are not simple recommendations but qualified recommendations, like those of UNESCO or ILO.

Assimilation of the recommendations with international agreements -- even if at first sight it might be attractive -- tends to obliterate the differences that exist between these two modalities by which the states -- as sovereign and equal legal subjects -- institute legal standards that govern the cooperative relations within CEMA. We do not believe that this is the purport of the provisions, or of the CEMA Statute, or of the Complex Program [11], that specified both categories of documents without equating them. Even though both the recommendations and the international conventions ultimately, in a ceratin way, achieve an agreement of will of the states involved, we should not disregard the essential differences between them, such as: their origin, the conventions being an emanations of the signatories, whereas the recommendations are unilateral acts of CEMA bodies and express the will of the organs that adopted them; the manner in which they produce their effects, the conventions coming into force by signing or ratification or approval by the supreme organs of the state power or administration, whereas the recommendations, by acceptance by the proper bodies in the countries that declared their interest, bodies whose level may be below that of the above-mentioned supreme organs; or the procedure of expiry, the conventions at the expiry of the period for which they were concluded or by denunciation, whereas the recommendations, as a rule, do not have a period of validity and also, cannot be denounced directly unilaterally. Likewise, in terms of contents: whereas the international conventions have well delineated the topics, rights, and obligations which they generate and the period during which they should be implemented, the recommendations often -- at least in procedures so far -- do not have these elements, which are indispensable to an international convention, adequately outlined.

As for the General Requirements for Delivery CEMA, either in the 1958 version, or those of 1968/75 -- in connection with which this problem was posed specifically -- after they were recommended by the CEMA Permanent Commission for Cooperation in Foreign Trade, they took effect and began to produce legal impacts as a result of their being accepted by the proper organs in each country in CEMA, which, in accordance with its laws, introduced them in the national legal context. To this end, a number of countries adopted decisions of some central organs of state administration (for instance, the Ministry of Foreign Trade, for the German Democratic Republic and the Soviet Union) or of some central organs of state power (for example, a Decree of the State Council, for the Socialist Republic of Romania). But regardless of the body which examined and accepted the recommendation or the manner in which the legal provisions involved in the recommendation were introduced in the internal legal context of each state that accepted them, the essential point is that they assumed such a legal strength that they became mandatory for the foreign trade organizations of CEMA countries and also for other bodies which are involved in foreign trade activity. Furthermore, we must point out that the way in which the General Requirements were incorporated into the internal legal context of states excludes the possibility of their being regarded as an immediately executory decision of an international organ or a genuine international convention [12].

Moreover, practice in CEMA itself excludes equating recommendations with international conventions, as both are different forms of creating legal provisions which are applicable to relations of economic and scientific-technical cooperation among CEMA countries. Otherwise it would not be possible to explain why the organization's Statute and the Complex Program provides for both, and in practice, not only both forms are used individually, but sometimes, even for the settlement of the selfsame problem, as was the case of the Convention on arbitral settlement of civil law disputes resulting from economic and scientific-technical cooperation, signed in Moscow on 26 May 1972 and which was preceded by a recommendation of the CEMA Executive Committee. If the legal significance of the recommendations had been identical to that of international agreements, it is evident that in this case there would not have been the need for signing a convention.

The need for the legal provisions contained in recommendations to be introduced in the national legal context of each state through internal legal acts causes these provisions not to have an international character, with the legal source involving the legal act of each state that accepted the recommendation (even though the need for adopting the legal act results from acceptance of the recommendation). This also generates the possibilities of differences in interpreting and implementing uniformly the legal provisions involved. These are disadvantages which legal literature has pointed out and which explain a recent certain preference for the traditional procedure of international convention [13].

As far as we are concerned, at least for the General Requirements formulated so far, it seems to us that we are faced with a procedure which is similar to that of adoption of uniform legal regulations worked out under the sponsorship

of international organizations, with the possibility of distinguishing between the recommendation for introducing in the internal legal context the uniform law and the latter -- specifically the General Requirements -- which becomes mandatory only after it was introduced in the national legal context, as a result of meeting the internal procedure in each state [14]. Consequently, the General Requirements have the legal value of the internal acts through which they were introduced in the legal context of each CEMA country, in accordance with its legal provisions. Because these General Requirements, like all the uniform legal provisions formulated within an international organization and recommended to the member states, formally have the character of internal legal regulations, even if they are the result of cooperation between CEMA organs, that adopt recommendations, and the authorities of the member states of the organization, that accept them and afterwards introduce them in their national legal context [15]. However, we do not feel, as was sometimes maintained, that, as a result of introduction in the national legal context, each country would have the possibility, unilaterally, to modify them. Opposing this possibility are the legal connection which develops between CEMA -- as an international organization -- and the states involved by acceptance of the recommendation and whose implementation they must ensure (Article II, item 4 [a] in the Statute), and the idea of legal uniformization, which underlay the adoption of the General Requirements for some areas of economic cooperation.

4. Further, it is necessary for us to determine whether the General Requirements for Delivery CEMA 1968/75 and the other general requirements adopted are unified legal provisions, as it is sometimes stated, constituting a common economic law of CEMA countries or are uniform legal provisions.

For instance, it was maintained that the legal provisions formulated within CEMA framework and applicable in the relations between foreign trade organizations in CEMA countries would form a unified law, a special juridical system with an international character, on an autonomous basis in relation to the national legal systems of CEMA countries and with priority applicability vis-a-vis national law [16].

It is a point of view with which we can agree.

Within the framework of CEMA -- in contradistinction, for instance, to the European Economic Community -- there is no direct legislative activity of CEMA organs, so that the legal provisions are either formulated within CEMA, but proposed to the states for acceptance by means of recommendation according to Article IV of the Statute, and only the states' acceptance gives them legal strength and permits implementation, or are created by means of an international convention, submitted for ratification or approval to the supreme organs of the state power or administration in each country. Hence, within the framework of CEMA, there is no activity of direct creation and application of the legal provisions on economic and scientific-technical cooperation, as these provisions are introduced in the national legal context and implemented in accordance with the legal provisions in each country. These modalities

of adopting the legal provisions, of "incorporating" into the national legal systems are the expression of the principle of free consent which underlies the cooperation among CEMA member countries, of intertwining international economic cooperation with national sovereignty [17].

For the purpose of eliminating the deficiencies caused by the national character of the regulations that govern the legal relations of international trade, the science and technique of law formulated several procedures which, according to the method of settlement used, could be classified in two major categories: those that utilize the legislative method, in which the solutions adopted are the result of state sovereignty, and those that utilize the contractual method, in which the contracting parties decide on settlements, within the limits allowed by the imperative provisions. As for the legislative method, it involves three procedures: legislative uniformization, legislative dovetailing (or harmonization) and use of the conflictual law lex voluntatis. For what we aim to point out, only the first procedure concerns us (legislative uniformization).

Since the regulation of legal relations is an attribute of state sovereignty, the notion of unification -- which is often used -- is capable of posing for discussion the very idea of sovereignty, because "it gives the impression that unification has created a new system of law, different from any national system of law" [18]. Actually, when we speak of unification, it must be understood that the same regulation, regardless of the approach -- model law, international convention, and so on -- is adopted by different states, by free consent, and this results in the identical contents of the regulations within the framework of the different states. Hence, it is not a matter of legislative unification -- as for instance, when a plurilegislative state replaces the various preexistent systems of law with a new system for all the country -- but an identical regulation in several states, and this based on an initiative which is the manifestation of distinct sovereignties, with the consequence that, in all states, each system of law retains its autonomy. In such situations, when one speaks of unification of the legal provisions of different countries, actually it is the matter of uniformization of the internal national laws of the states involved [19].

Consequently, uniformization represents the process of adoption by different states, on a sovereign basis, of legal provisions with identical contents. As a result of adoption by the states, these legal provisions become components of different systems of law and constitute a uniform law, an integral part of the national law of each state. Such uniformizations were achieved on a world scale in the area of material law (as for instance, the uniform Law on selling corporate mobile assets, The Hague, 1955). Within CEMA also, there were achieved such uniformizations, with the major ones pertaining to the legal status of selling-buying contracts, contracts for assembly and technical servicing, under the General Requirements for Delivery CEMA 1968/75, the General Requirements for Assembly CEMA 1973 and the General Requirements for Technical Servicing CEMA 1973. These general requirements constitute a genuine positive law, a uniformization of legal provisions of international trade, with a legislative character, not "a codification of common usances, in effect, in the countries with a socialist system," as it has sometimes been asserted [20].

These General Requirements coexist with the common law of each socialist country in CEMA, whose contents and regulatory sphere were not affected, but which, for the legal relations regarding selling-buying, completion of assembly projects and technical servicing with foreign trade organizations in CEMA socialist countries will have value of lex causae only on a subsidiary basis, in supplementation of the General Requirements involved [21]. Consequently, it is not a matter of priority application of an autonomous law system versus the national law, but the application of legal provisions that are components of the national law of each CEMA member state, of legal relations in areas for which the provisions involved were developed and incorporated into the national law systems, because "the system of legal provisions regulating economic and scientific-technical cooperation among CEMA countries does not constitute a superstate law, but expresses the sovereign will of each country" [22]. The legal system of each country is unified, and the uniform legal provisions, adopted in the areas that are liable to uniform regulation, complete the overall legal status of the relations of foreign trade and economic and scientific-technical cooperation in each national law.

Moreover, under these General Requirements there was no "unification" of preexistent internal regulations in CEMA countries, regulations which were not, adequately, tailored for international trade, but created and uniformized were new legal provisions, in the area of regulations with a prevailingly suppletive character, corresponding to the nature of the legal relations which the foreign trade organizations in CEMA countries establish in the process of economic and scientific-technical cooperation. Hence, with these General Requirements we are not facing a legislative unification, but, as has been pointed out, an uniformization of legal provisions in the national legal systems, a process with a different legal and political significance.

In conclusion, we may state that the legal nature of the General Requirements formulated in CEMA and adopted by the member states of the organizations to govern the legal relations of selling-buying, assembly and technical servicing which the foreign trade organizations in these countries develop is that of provisions of uniform law, whose legal strength is provided by the legislative acts under which each member state of CEMA has introduced them into the national legal context.

FOOTNOTES

1. N. Ceausescu, "Raport la cel de-al XII-lea Congres al Partidului Comunist Roman" [Report to the 12th Congress of the Romanian Communist Party], Editura Politica, 1979, p 49.

2. "Programul Partidului Comunist Roman de Faurire a Societatii Socialiste Multilateral Dezvoltate si Inaintare a Romaniei Spre Comunism" [RCP Program for Building a Multilaterally Developed Socialist Society and Romania's Advancement Toward Communism], Bucharest, Edit. Politica, 1975, p 175.

3. Preceded by the 1958 version.

4. Approved by Decision No 1725/1973 of the Council of Ministers, in: BULLETIN OF SOCIALIST REPUBLIC OF ROMANIA [RSR] I, 9, No 205, 1973.

5. Approved by Decision No 1724/1973 of the Council of Ministers, in: BULLETIN OF RSR I, 9, No 204, 1973.

6. Ratified, by Decree No 164/1975, in BULLETIN OF RSR I, 11, No 138, 1975 and respectively Decree No 49/1980, in: BULLETIN OF RSR I, 16, No 17/1980.

7. M. Boguslavski, Pravovoe Regulirovanie Vnesnetorgovoi Cupliprodaza v Otnoseniah Mezdu Socialisticeskimi Stranami, in: PROBLEMI MEZDUNARODNOGO CASTNOVO PRAVO, Moscow, 1970, p 45.

8. I. Nestor, in "Probleme Privind Arbitrajul Pentru Comertul Exterior in Tarile Socialiste Europene" [Problems of Arbitration for Foreign Trade in European Socialist Countries], Bucharest, Editura Academiei, 1962, p 151, considers the General Requirements for delivery as international agreement; M. Kemper and J. Kirsten, "Rechtsfragen der Neuen Etappe Internationaler Okonomischer Beziehungen Zwischen den Mitglidstaaten des Rates fur Gegenseitige Wirtschaftshilfe," in: STAAT UND RECHT, No 12, 1962, p 2179.

9. E. T. Usenko, "Formy Regulirovania Socialisticescovo Mezdunarodnogo Razdelnia Truda," Moscow, 1965, p 103. Likewise, "Kurs Mezdunarodnogo Pravo," Vol VI, Moscow, 1973, p 216.

10. Skubiszewski, "Uchwaly Pravotworze Organizaczi Medzynarodowich," Poznan, 1965, p 60.

11. Also see N. Androne, "Unele Aspecte Juridice ale Realizarii 'Programului Complex'" [Legal Aspects of Implementation of the "Complex Program"], in REVISTA ROMANA DREPT, No 10, 1975, pp 8-10; B. Manciu, "Recomandarile Consiliului de Ajutor Economic Reciproc (CAER) si Acordurile Internationale" [Recommendations of CEMA and International Agreements], in ST. CERC. JUR., No 4, 1975, pp 361-369.

12. J. Jakubovski, "Umova Sprzedazy w Handlu Miedzynarodowym," Warsaw, 1966, p 208, quoted by J. Caillot, "Le CAEM, Aspects Juridiques et Formes de Cooperation Economique Entre les Pays Socialistes," Paris, Libr. Generale de Droit et de Jurisprudence, 1971, pp 96-97.

13. J. Rajski, "Le Rapprochement et l'Unification du Droit Dans le Cadre du Conseil d'Aide Economique Mutuelle," in REV. INT. DROIT COMP., No 3, 1976, p 468.

14. Also see H. de Fiumel, "Rada Wzajemnej Pomocy Gospodarczey Studium Prawnomiedzynarodnowe," Warsaw, 1967, p 111, quoted by J. Caillot, op. cit., p 97; J. Rajski, op. cit., pp 463 and 468.

15. See J. Rajski, op. cit., p 473.

16. J. Jakubowski, "Le Developpement du Droit Economique Communautaire des Pays du CAEM et les Problemes Poses par son Application," in JOUR. DROIT INTERN., pp 680 and 694. Other times it is stated that "a special system of communitarian economic law" was created, cf. J. Rajski, op. cit., pp 467 and 473.

17. Also see B. Stefanescu and I. Rucareanu, "Principiile Colaborarii Economice si Tehnico-Stiintifice a R.S. Romania cu Celelalte Tari Socialiste" [Principles of Economic and Scientific-Technical Cooperation of the Socialist Republic of Romania With the Other Socialist Countries], in "Institutii de Drept Comercial International" [Institutions of International Commercial Law], Bucharest, Edit. Academiei, 1973, p 31.

18. Tudor R. Popescu, "Curs de Drept International Privat" [Textbook of International Private Law], Tip. Universitatii, Bucharest, 1975, p 175.

19. Ibid.

20. P. Kahn, "La Vente Commerciale Internationale," Paris, Libr. Sirey, 1961, p 27.

21. See paragraph 110 of CGL-CAER 1968/75; paragraph 39 of CGM-CAER/1973; paragraph 68 of CGDT-CAER 1973.

22. B. Stefanescu and I. Rucareanu, op. cit., p 40.

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RAW MATERIALS, POWER CONSUMED IN THE CHEMICAL INDUSTRY

Zagreb KEMIJA U INDUSTRIJI in Serbo-Croatian No 3, Mar 81 pp 103-110

[Article by B. Seferovic, Center for Engineering and Economic Studies and Development Programming of the Institute for Chemistry, Technology and Metallurgy in Belgrade: "Growing Consumption of Raw Materials and Energy in the Yugoslav Chemical Industry Over the Period From 1950 to 1990"; submitted 26 May 80, accepted 26 Dec 80]

[Text] The period from 1975 to 1985 is characterized by very intensive construction of a large number of factories for production of chemical raw materials. The new production units are large consumers of the initial raw materials, in this case nonmetallic minerals, above all material for the production of fertilizers and carbonaceous raw materials intended for production of petrochemicals and ammonia. A particularly large jump will occur in consumption of raw materials in the period 1980-1985 because in that period a number of projects in Pancevo, Sabac, Kutina, Zagreb, Sisak and Krk, aside from a number of others which are smaller in size and importance, will reach rated output or will go into production.

It is expected that the consumption of initial raw materials will be 7.8 million tons in 1985, and it is estimated at about 10.5 million tons in the year 1990. Consumption of all forms of energy, carbonaceous raw materials, electric power and heat is also growing at the same pace.

Our country's chemical industry has entered a period of intensive development in all its product fields. In the period from 1975 to 1985 about 50 new factories which will be producers of chemical raw materials are to be built within existing centers of production or at new sites, aside from the numerous expansions and new construction in the field of chemical processing and manufacturing. Heavy inorganic chemicals and fertilizers will have a share here of 6.0-6.5 million tons, and heavy organic raw materials and intermediate a share of 3.5-3.8 million tons.

In spite of the great diversity of its products, the chemical industry is based on a relatively small number of raw materials, among which the 10 leaders in terms of quantity stand out particularly; they have a share of about 90 percent in total consumption.

We usually divide the initial raw materials for chemical production into four groups: carbonaceous (petroleum, natural gas, coal and derivatives), nonmetallic minerals, metallic minerals and biological raw materials (of plant and animal origin). In 1975 the world chemical industry consumed 610 million tons of raw materials, and the Yugoslav chemical industry's share in that was 3.6 million tons, or 0.59 percent [1].

Carbonaceous Minerals Used as Raw Materials

Consumption of Carbonaceous Raw Materials

The underdevelopment of the petrochemical industry is still typical of our country. Up until the end of 1979 it was based on a small ethylene plant in Zagreb (22,000 tons per year), the production of aromatics in Rijeka (160,000 tons), benzene in Pancevo (10,000 tons), carbon black in Kutina (20,000 tons), alkyl benzene in Skoplje (10,000 tons), and cumene (13,000 tons) and styrene (12,000 tons) in Zagreb.

Ammonia production is based on natural gas in Pancevo (300,000 tons) and Kutina (215,000 tons), coke-oven gas at Lukavac (32,000 tons) and brown coal at Gorazde (15,000 tons). The factory at Obilic (100,000 tons), which is to consume gas produced in the gasification of lignite, has not gone into operation at all, and it is not known if and when it will.

Coal and derivatives of coking are also consumed as raw materials in the production of carbide (Ruse), in reduction of sulfates (Celje), and the liquid products of the coking plant are used to obtain aromatics (Lukavac).

The chemical manufacturing industry also consumes liquid hydrocarbons (gasoline, toluene and xylene), but the consumption in this field is considerably smaller.

The methyl alcohol plant in Lendava (165,000 tons), which can consume gasoline or natural gas in its production, began operation in 1979. The ethylene plant at Pancevo (200,000 tons), which is today the largest domestic consumer of raw gasoline, went into operation at the end of that same year. An ethylene plant (90,000 tons) in Zagreb using ethane is expected to go into operation during 1980.

In the 1981-1985 period a sizable number of new units consuming gaseous and liquid hydrocarbons will begin operation. They include plants for ethylene on Krk (400,000 tons), aromatics in Sisak (230,000 tons), benzene on Krk (180,000 tons), linear alkyl benzene in Belgrade (50,000 tons) and carbon black in Kutina (40,000 tons).

The following will be new consumers of natural gas: 3 ammonia plants: Kutina (450,000 tons), Pancevo (300,000 tons) and Sabac (330,000 tons); a methyl alcohol plant in Kikinda (200,000 tons) and a carbon disulfide plant in Loznica (25,000 tons).

The usual average standard rates were used in calculating consumption, and use of capacity was estimated on the basis of the past experience of the domestic chemical industry. Table 1 shows the pattern of consumption over the period 1970-1985.

Table 1. Consumption of Carbonaceous Minerals as Raw Materials in the Chemical Industry (in thousands of tons)

	1970	1975	1980	1985
Natural gas (millions of cubic meters)	270	390	550	1,400
Natural gas	195	280	395	1,010
Gasoline, other liquid hydrocarbons and ethane (1)	110	405	740	1,710
Coal and derivatives (2)	155	115	135	150
Total (3)	460	800	1,270	2,870

Notes: 1. The amount of gasoline from pyrolysis used in the production of ethylene and related products was subtracted.
2. All the raw materials consumed were converted to amounts of standard bituminous coal. The Obilic nitrogen fertilizer plant was not included.
3. The total amount is given in tons. Natural gas was converted on the basis of .72 kg = 1 cubic meter.

Supply of Carbonaceous Raw Materials

Petroleum consumption in our country is growing faster than production. Domestic natural gas production has for years satisfied the low domestic consumption, but today it is being imported and not just for consumers in the chemical industry. Domestic coke production is entirely based on imported coal. Table 2 surveys domestic production of natural gas, petroleum and coke and the imports of petroleum and coking coal in the period 1970-1978 [2, 3].

Table 2. Domestic Production and Imports of Carbonaceous Minerals Used as Raw Materials in the 1970-1978 Period

	1970	1975	1976	1977	1978
Production					
Natural gas (millions of cubic meters)	977	1,553	1,730	1,897	1,935
Petroleum (thousands of tons)	2,854	3,692	3,880	3,961	4,076
Coke (thousands of tons)	1,309	1,343	1,786	1,765	1,921
Imports					
Petroleum (thousands of tons)	4,466	7,397	8,293	9,650	10,380
Coking coal (thousands of tons)	1,715	1,770	2,198	2,354	2,767
Petroleum consumption					
Consumption of refineries (thousands of tons)	7,091	10,739	11,724	13,847	14,223

Petroleum consumption is estimated at 15.7 million tons for 1979. Consumption's further course will follow an average annual growth rate of 7.1 percent according to certain estimates. With respect to consumption of natural gas, which depends above all on construction of the gas pipeline network, forecasts vary widely. Our

country is connected through Slovenia and Vojvodina to the gas pipeline system fed from the USSR.

As its consumption of natural gas and petroleum increases, our country will be more and more dependent on imports of these raw materials. Thus in 1985 we can expect that imported petroleum will have a share of about 80 percent and natural gas about 50 percent in total domestic consumption.

Petroleum is being imported from several countries. In 1978 50 percent of the imports came from Iraq and 40 percent from the USSR. These two countries have been Yugoslavia's principal suppliers over the past decade.

In 1977 domestic coking plants produced 1,765,000 tons of coke along with 16,100 tons of crude benzene and 10,800 tons of ammonium sulfate. The amount of the by-products could be still larger. Less than half of the coke-oven gas is used at Lukavac to produce 32,000 tons of ammonia per year, but most of it is burned on the flare.

Present-Day Efforts To Use Coal as a Raw Material in Chemical Production

Today 95 percent of the world's output of heavy organic chemicals is based on natural gas and petroleum. This share has risen steadily in recent years, as shown by Table 3. There is very little room left for this dependence to increase, since such a high level has been reached that there is only small room for growth [4].

Table 3. Share of Petroleum and Natural Gas in Production of Heavy Organic Chemical Products, in percentage

1950	1955	1960	1965	1970	1975	1977
44	55	64	78	90	94	95

We can expect that in spite of the rising prices of petroleum and natural gas, which have been rising faster than the general rate of inflation in the world, this kind of high dependence will last on for several years in the future because the chemical processing of hydrocarbons has technological and economic advantages over other carbonaceous raw materials. Procedures based on natural gas and petroleum derivatives afford the shortest technological route, production units with high efficiency and productivity, and the lowest capital investment, and they are also suitable from the standpoint of environmental protection as compared to units based on coal or derivatives obtained from its chemical processing.

If in future the price of petroleum rises faster than the prices of other raw materials, coal above all, we can expect a corresponding growth of interest in production processes based on coal. It is estimated that in 1985 ammonia and methyl alcohol will be cheaper obtained from coal than from natural gas. These estimates were based on present trends of prices and technological advances. The production of SNG (substitute natural gas) and liquid hydrocarbons is another field of research. A third line in contemporary research is obtaining heavy chemicals, especially ethylene, because of its priority importance in chemical production. These

projects are no longer just conceptions. Today a sizable number of experimental and semi-industrial plants for chemical processing of coal are under construction; some of them will consume as much as 1,000 tons of coal per day, and the individual investments exceed $1 billion. Particularly intensive work is being done in this field in the United States, West Germany, the Union of South Africa, and in a number of other countries.

Nonmetallic Minerals Used as Raw Materials

Consumption of Nonmetallic Minerals as Raw Materials

These minerals are in first place with respect to their volume of consumption in the chemical industry. Some of them are consumed in very large quantities, such as raw phosphates, salt, potassium salts, and pyrite. They are followed by elemental sulfur, borates, quartz sand, barite, etc.

In our country the production of sulfuric acid is based on pyrite, sinter-plant gases (from the plant where concentrated copper and zinc ores are sintered) and elemental sulfur. The total sulfuric acid capacity at the end of 1979 was 2.15 million tons (MH) per year, and in 1985 it will be 3.14 million tons (MH) per year [5].

The production of phosphorus fertilizers has developed in pace with the production of sulfuric acid, first of all superphosphate and later phosphoric acid, as an intermediate product in the production of NP- and NPK-fertilizers and to a lesser extent the production of Na- and Ca-salts (tribasic sodium phosphate, dibasic calcium phosphate, etc.). At the end of 1979 the total capacity for production of phosphoric acid was 470,000 tons (P_2O_5) per year, but in 1985 it will reach 700,000 tons (P_2O_5) per year.

Salt (NaCl) is the principal raw material in the production of chlorine, soda ash and caustic soda. In our country at the end of 1979 there were eight electrolysis plants for sodium chloride and one for calcium chloride, with a total capacity of 102,000 tons of Cl_2, 110,000 tons of NaOH and 6,000 tons of KOH. The electrolysis facility in Pancevo (85,000 tons of Cl_2) began operation at the beginning of 1980. Thanks to the reconstruction and expansion of certain existing plants, we can expect that the total capacity of them all will be 240,000 tons of Cl_2 and 265,000 tons of NaOH in 1985. The present soda factory in Lukavac has a capacity of 160,000 tons of Na_2CO_3 per year, and by the end of 1980 it is to be expanded to 220,000 tons. Table 4 gives a survey and estimated growth of consumption of the most important nonmetallic minerals used as raw materials.

Of the other nonmetallic minerals used as raw materials we should also mention (along with 1978 consumption) quartz sand (11,000 tons), barites (10,000 tons) and various fillers: kaolin, bentonite, talc and others (about 80,000 tons).

The Supply of Nonmetallic Minerals Used as Raw Materials

Nonmetallic minerals used as raw materials can be divided into three groups on the basis of their origin:

i. imported: phosphate rock, potassium salts, elemental sulfur and mineral borates,

ii. partly imported: salt and pyrite,

iii. domestic: quartz sand and barites.

Table 4. Consumption of Nonmetallic Minerals as Raw Materials in the Chemical Industry, in thousands of tons

	1970	1975	1980	1985
Pyrite (45% S)	278	333	580	660
Smeltery gases (100% SO_2)	280	336	400	420
Elemental sulfur (S) (1)	18	22	70	250
Crude phosphates (33% P_2O_5) (2)	805	953	1,100	1,500
Potassium salts (60% K_2O)	270	302	475	580
Salt (NaCl) (3)	260	316	430	690
Lime (CaO)	215	180	160	220
Mineral borates	6.7	15.1	25	35
Other raw materials	90	101.5	130	185
Total	2,220	2,560	3,370	4,540

Notes: 1. In 1985 80 percent of the sulfur will be consumed in the production of sulfur acid.
2. The capacity that will exist in 1985 will be capable of processing about 2.5 million tons of phosphate rock.
3. Also includes the content of salt in salt water at the soda ash factory in Lukavac.

Table 5 shows imports of the principal nonmetallic minerals used as raw materials over the period from 1970 to 1978.

Table 5. Trend of Imports of Nonmetallic Minerals Used as Raw Materials, in thousands of tons

	1970	1975	1976	1977	1978
Phosphate rock	789.7	846.5	880.5	1,066.1	902.6
Potassium salts	288.3	247.3	333.0	378.7	443.2
Elemental sulfur	21.7	43.7	48.3	56.7	59.2
Salt	145.5	113.5	141.6	158.1	149.2
Pyrite	94.7	101.3	12.0	72.6	19.1
Mineral borates	6.5	20.1	14.5	24.9	28.7

A phosphate deposit has been found in our country with an estimated reserve of about 100 million tons of ore with a concentration of 10 percent P_2O_5; it is located near Bosiljgrad. Work is under way to ascertain the possibility of exploitation and to estimate the commercial value of this deposit.

Consumption of elemental sulfur began to take on a sizable volume only when it began to be consumed in the production of sulfur acid. There is no native sulfur in our country. Sulfur might be produced in coking plants and petroleum refineries in an amount that would depend on the quantity and quality of coal or petroleum being processed. We estimate that on the basis of the amount of petroleum refined and coal coking in 1980 it would be possible to produce about 100,000 tons of sulfur, assuming average quality of the raw materials.

Salt is produced in our country by five small seawater evaporation ponds in which production fluctuates greatly depending on weather conditions. The production of rock salt in Tuzla is on the rise and is better in quality than sea salt, but its price is high and difficult to accept for the chemical industry, except for brine consumed directly at Lukavac.

The principal pyrite producer in our country is the Bor Copper Mine and Smeltery, which recently expanded its pyrite production capacity to 600,000 tons per year. There are also possibilities of producing large amounts of pyrite at flotation plants for lead and zinc concentrate.

Metallic Raw Materials

Consumption of Metallic Raw Materials

This group of raw materials takes last place on the basis of its share in chemical production. The ones which in our country are processed in sizable amounts by the chemical industry are titanium concentrate (ilmenite and rutile), Al-hydrate, copper, lead, zinc and chromium concentrate to make mineral pigments, metal salts, additives, pesticides and certain other derivatives, in which the tradition goes back many years.

Table 6 shows the trend in consumption of the principal metallic raw materials in the domestic chemical industry. The leader in quantity is titanium concentrate, and then come Al-hydrate, zinc, copper, lead and chromium concentrate.

Table 6. Consumption of Metallic Raw Materials in the Chemical Industry, in thousands of tons

	1970	1975	1980	1985
Titanium concentrate (50% TiO_2)	1.2	35.6	45.0	45.0
Aluminum hydrate (Al_2O_3)	8.6	16.5	26.0	35.0
Zinc (Zn)	7.8	6.5	9.0	12.0
Copper (Cu)	4.5	4.9	5.2	5.5
Chromium concentrate (40% Cr_2O_3)	5.5	4.4	5.4	8.0
Total	31.6	71.7	99.6	115.5

We should not expect any sizable jumps in this area since total production of most of the products is rather small by comparison with other chemical products. Speculation about establishing any sizable chemical production operation on the basis of domestic metals is therefore unrealistic.

The Supply of Metallic Raw Materials

The domestic chemical industry uses domestic raw materials in the production of lead, zinc, copper and aluminum derivatives. Chromium and titanium concentrates are imported in their entirety. Whereas titanium concentrate is used only in chemical processing, chromium concentrate has its principal use in the production of silicochromium and ferrochromium, and the share of the chemical industry in its consumption was only 8 percent in 1975.

Table 7 shows imports of titanium and chromium concentrates. We should mention that domestic chromite deposits have been almost completely exhausted and that domestic production of chromium ore has amounted to only about 1,500-2,000 tons in recent years.

Table 7. Imports of Titanium and Chromium Concentrate, in thousands of tons

	1970	1975	1976	1977	1978
Rutile (titanium ore)	1.4	51.9	45.1	47.3	45.9
Chromium ores (I, II and III A)	70.0	160.2	176.2	222.3	218.4
Chromium concentrate	--	12.3	8.1	3.1	0.6

Biological Raw Materials

Consumption of Biological Raw Materials

Raw materials of plants and animal origin have been used for a great number of years in chemical production, practically since the beginning of industrial chemical production. This production also has a lengthy tradition in our country (production of soap, alcohol, varnish and essential oils, destructive distillation of wood, the processing of bones and hide scraps, and so on). Production of cellulose fibers and synthetics, fatty and other organic acids, miscellaneous pharmaceutical raw materials (vitamin C, antibiotics, etc.) and other products has been introduced in the postwar period.

Of new products in the field of consumption of biological raw materials we should mention expansion and introduction of the new production of chemical derivatives of cellulose, the production of amino acids (lysine and monosodium glutamate), citric acid, fatty acids and their derivatives, etc.).

Table 8 shows the development of consumption of biological raw materials in the domestic chemical industry. The table does not include raw materials for obtaining essential oils, wood for destructive distillation or certain others of minor importance.

The current high price rises of petroleum and the disruptions which have ensued on the market for this most important raw material of the present time have provided the motivation for diverse initiatives toward greater utilization of biological raw materials and their transformation into chemical raw materials. Every decision along this line should be well studied, especially if it concerns the processing of

foodstuffs into chemicals. In many cases, such as in the chemical processing of starch from grain or sugar from beet juice, the price of the chemicals obtained is considerably higher than the price of the same products obtained by petrochemical means. We should also bear in mind that world food production is inadequate and that there is a particularly marked shortage of protein products. It is therefore of greater interest and economically more favorable to produce food.

Table 8. Consumption of Biological Raw Materials in the Chemical Industry, in thousands of tons

	1970	1975	1980	1985
Technical greases	29.8	29.5	35.0	45.0
Cellulose	41.8	78.2	85.0	105.0
Starch, dextrin, sugars	4.2	5.0	7.5	10.0
Molasses (50% sucrose)	10.5	14.5	30.0	80.0
Bones and scraps of animal origin	30.0	25.0	30.0	35.0
True resins	4.2	5.5	6.5	7.5
Charcoal	4.1	4.8	6.0	7.0
Other products of plant origin	3.8	5.0	6.2	7.4
Total	128.4	167.5	206.2	296.9

The Supply of Biological Raw Materials

The technical oils and greases imported are palm butter, coconut oil, fish oil, castor oil and linseed oil, and a portion of the tallow. Cellulose is also imported for chemical processing to make rayon cord and fabric and nitroderivatives. Vegetable gums and resins, among which rosin takes the leading place, are largely imported.

Table 9 shows the imports of biological raw materials. Total imports of pulp are larger, and here only cellulose for the chemical industry is shown. Technical oils and greases are also consumed in other industries, the chemical industry accounting for about 60 percent of the amount shown.

Table 9. Imports of Biological Materials Intended for the Chemical Industry, in thousands of tons

	1970	1975	1976	1977	1978
Cellulose for the chemical industry (sulfite and sulfate pulp, bleached)	20.2	41.2	37.6	47.0	14.9
Technical oils and greases	23.7	17.6	16.0	18.9	21.6
Vegetable gums and resins	4.1	4.6	0.8	2.7	2.7

The conditions exist for complete and augmented supply of all the carbohydrate and protein raw materials from domestic sources.

Trend of Total Consumption of Raw Materials and Variation of the Proportional Pattern

If we compare the pattern of consumption of raw materials in our country in 1975 with the same pattern in the world, essential differences are seen, especially with respect to the share of carbonaceous and nonmetallic raw materials. The share of carbonaceous raw materials is lower in our country, which is a consequence of the underdevelopment of the petrochemical industry. Within this group there is in turn a high share of consumption of raw materials for ammonia production (34 percent). At the same time the share of nonmetallic minerals is higher than in the world average. Table 10 presents a comparison of the quantities and relative proportions of the various groups of raw materials [5].

Table 10. The Pattern of Consumption of Raw Materials in the World Chemical Industry and in Yugoslavia in 1975

	World		SFRY	
	Millions of Tons	%	Thousands of Tons	%
Carbonaceous	200	32.8	800	22.2
Nonmetallic	370	60.7	2,560	71.1
Metallic	10	1.6	72	2.0
Biological	30	4.9	168	4.7
Total	610	100.0	3,600	100.0

Table 11 gives the total consumption of raw materials in the chemical industry, but we should mention that the amounts given for the year 1990 should be taken as indicative, since the level of chemical production for the period after 1985 is difficult to examine in more accurate terms. Attainment of the volume of consumption given for 1985 may be jeopardized by a possible delay in starting up certain large consumers (the ethylene plant on Krk, the ammonia plant in Sabac, or others).

Table 11. Trend and Pattern of Consumption of Raw Materials in the Yugoslav Chemical Industry Over the Period 1950-1990, in thousands of tons

Raw Materials	1950	1960	1970	1975	1980	1985	1990
Carbonaceous	37	108	460	800	1,270	2,870	4,000
Nonmetallic	202	724	2,220	2,560	3,370	4,540	5,900
Metallic	8	18	32	72	100	115	160
Biological	37	90	128	168	205	295	440
Total	285	940	2,840	3,600	4,945	7,829	10,500

In the chemical industry we have three large areas in which raw materials are consumed: manufactured fertilizers, petrochemistry and alkalies along with chlorine, and a fourth area referred to as "miscellaneous" production.

The manufactured fertilizer industry is a consumer of phosphates, more than 80 percent of the sulfurous raw materials (for sulfuric acid), carbonaceous raw materials

(for ammonia) and potassium salts (for NPK-fertilizers). Petrochemistry bases its production on petroleum derivatives, natural gas and the products of extraction of gasoline from natural gas. In the production of alkalies and chlorine the principal raw material is salt, and then also lime for soda ash and its causticization.

The amount consumed by each of these three groups has been computed in Table 12. It is evident from the table that there are to be large changes accompanying changes in the proportional pattern of production in the domestic chemical industry, that is, accompanying the increase in the share of the petrochemical industry.

Table 12. Consumption of Raw Materials in the Principal Fields of Production of the Yugoslav Chemical Industry, in thousands of tons and percentage

	1950		1960		1970	
	Thousands of Tons	%	Thousands of Tons	%	Thousands of Tons	%
Manufactured fertilizers	66	23.2	372	39.6	1,675	59.0
Petrochemicals	--	--	8	0.8	85	3.0
Alkalies and chlorine	84	29.5	218	23.2	250	8.8
Miscellaneous fields	135	47.3	342	36.4	830	28.2
Total	285	100.0	940	100.0	2,840	100.0
Share of imported raw materials, %	77	27.0	430	45.7	1,425	50.1
Index number of growth (1970 = 100)						
Total consumption of raw materials	10.0		33.1		100.0	
Imported raw materials	5.4		30.4		100.0	

	1975		1980		1985	
	Thousands of Tons	%	Thousands of Tons	%	Thousands of Tons	%
Manufactured fertilizers	1,910	53.1	2,650	53.6	3,725	47.6
Petrochemicals	380	10.6	770	15.6	1,855	23.7
Alkalies and chlorine	430	11.9	570	11.5	880	11.3
Miscellaneous fields	800	24.4	955	19.3	1,360	17.4
Total	3,600	100.0	4,945	100.0	7,820	100.0
Share of imported raw materials, %	1,830	50.8	2,690	54.4	4,895	62.6
Index number of growth (1970 = 100)						
Total consumption of raw materials	127.5		174.1		275.4	
Imported raw materials	128.4		188.8		343.5	

Supply of Raw Materials to the Chemical Industry

Domestic Sources of Raw Materials

Among the principal raw materials for the chemical industry our country possesses large quantities of sulfide ores (pyrites and concentrated ores of copper, lead and zinc), and it must import all the others in part or in their entirety. Our country has a scarcity of most raw materials needed by the chemical industry, and as a practical matter there are few prospects for improvement of the situation, so that the dependence on imports will in fact increase as chemical production continues to grow.

We should mention that nearly all the European countries, except for the USSR, have a great shortage of raw materials for the chemical industry. Some of them possess certain raw materials, for example, natural gas (Holland, Great Britain), sulfur (Poland and France), potassium salt (West Germany, GDR, France), salt (Poland, West Germany, GDR, Romania, France, etc.), while all those countries import petroleum, phosphates, concentrated titanium and chrome ore, mineral borates, nonferrous metals, etc.

Our country's shortage is very great for the two most important groups, the carbonaceous and nonmetallic raw materials. One sometimes hears the opinion that the domestic chemical industry could be supplied with sea salt, potassium salts from the processing of certain minerals of eruptive origin, elemental sulfur from pyrite, and so on. All these ideas are technologically feasible, but they are economically unacceptable today. The same raw materials are cheaper from other sources, sometimes even a fraction of the cost. These assessments mainly occur because of a lack of familiarity with the volume of consumption of these raw materials and also with the funds that would have to be invested and the amount of energy that would have to be consumed in that kind of production.

The chemical industry should be built and developed. It has today become a mighty producer of raw materials and intermediate products. The lack of domestic raw materials is a burden on its operation, but it must not hinder its development.

Importation of Raw Materials for the Chemical Industry

The domestic chemical industry's high degree of dependence on imports is shown by Table 13, which gives the relative share of imports of its most important raw materials in their total consumption.

Very great efforts are being made today in the world to obtain sufficient amounts of carbonaceous raw materials, these efforts consisting mostly of developing new technologies for obtaining liquid and gaseous hydrocarbons from coal, asphalt deposits, oil shale and vegetable matter. Our country also has conditions for development of this kind of production, and work should be undertaken in that direction.

Energy Consumption in the Chemical Industry

The chemical industry is a large consumer of energy and in the industrially advanced countries occupies a distinguished place with respect to its share in total

consumption of energy by industry. We must divide energy consumption in the chemical industry into two separate groups according to the purpose for which it is consumed:

a) the energy portion, which is made up of electric power and thermal energy (various types of fuel) consumed to drive motors and in various operations in which heat is used,

b) the raw material portion, which consists of carbonaceous fuels (gas, coal, petroleum and their derivatives) which are used as raw materials in chemical production, as we have already discussed.

Table 13. Relative Share of Imports of the Most Important Raw Materials of the Chemical Industry in Their Total Consumption, in percentage

Raw Materials	1970	1975	1980	1985
Petroleum	63	66	74	80
Natural gas	0	0	35	65
Crude phosphates	100	100	100	100
Potassium salts	100	100	100	100
Salt (sodium chloride)	24	23	40	50
Pyrite	(16)	0	0	0
Elemental sulfur	100	100	100	100
Mineral borates	100	100	100	100
Barites	5	16	8	0
Quartz sand	11	10	5	0
Copper, lead and zinc	0	0	0	0
Aluminum hydrate and alumina	0	0	0	0
Chromium concentrate	65	98	100	100
Titanium concentrate	100	100	100	100
Cellulose for the chemical industry	46	22	22	30
Technical oils and greases	50	35	35	35

Energy consumed in electrochemical processes can be classified under both the former and latter group of consumers, but it is still closer to the latter, since its consumption is directly proportional to production. Much the same is also true of electrothermal processes, but here the electric power is exclusively a source of heat, while in electrochemical processes it can be treated as a chemical reagent.

Consumption of fuel and power in the domestic chemical industry between 1955 and 1975 is shown in Table 14. It is notable that the consumption of electric power and also fuel intended solely to obtain thermal energy has been proportional to the total amount of raw materials consumed.

The ratio of the consumption of fuel and power to total consumption of initial raw materials has maintained a steady value and has ranged between 0.81 and 0.86 for electric power and between 0.40 and 0.47 for fuel.

On the basis of these values we can approximately foresee the trend in consumption of fuel and power in the future, though certain shifts of these coefficients are

possible because of the changing pattern of consumption of raw materials and the relative increase in consumption of carbonaceous raw materials.

Table 14. Trend in Consumption of Fuel and Power in the Chemical Industry Over the Period From 1955 to 1975, in thousands of tons

	1955	1960	1965	1970	1975
Consumption of raw materials	480	940	1,920	2,840	3,600
Consumption of electric power (in millions of kilowatt-hours)	412	773	1,551	2,347	3,065
Fuel consumption (in thousands of tons SKE*)	225	380	880	1,330	1,705
Ratio					
Millions of kilowatt-hours/ Thousands of tons	0.86	0.82	0.81	0.83	0.85
Thousands of tons SKE/Thousands of tons	0.47	0.40	0.46	0.47	0.47

* SKE explained in following paragraph.

Table 15 shows total consumption of energy in the chemical industry, including the portion used as raw materials as well. In the table the consumption of all forms of energy is converted to units of coal, including electric power (1 kwh = 0.6 SKE). The figures presented show the total energy consumption in the chemical industry has been rising faster than total consumption of raw materials. In 1975 this ratio attained a value of 1.32. In future development we can expect it to increase in view of the relative growth in the share of carbonaceous raw materials in the total amount of both raw materials and also total energy (in tons of SKE--Steinkohleeinheit--or tons of EU--equivalent coal, whose value is 7,000 kilocalories/kg).

Table 15. Total Energy Consumption in the Chemical Industry Over the Period From 1955 to 1975

	1955	1960	1965	1970	1975
Carbonaceous raw materials, thousands of tons of SKE	74	120	359	668	1,209
Electric power, thousands of tons of SKE	247	464	931	1,408	1,839
Fuel, thousands of tons of SKE	225	380	880	1,330	1,705
Total, thousands of tons of SKE	546	964	2,170	3,406	4,753
Tons of SKE/Tons of raw materials	1.14	1.03	1.10	1.20	1.32

The figures given in Tables 14 and 15 indicate that energy consumption in the chemical industry can be forecast, since the patterns of consumption up to now indicate certain proportions and regularity.

Conclusion

The shortage of raw materials needed by the domestic chemical industry is growing. The dependence on imports is particularly high for carbonaceous and nonmetallic raw materials. These two groups represented 93.5 percent of the total amount of raw materials in 1975, and their proportion in 1985 will be 95.6 percent. According to what we now know and the extent of exploration of the domestic raw materials base, we cannot expect any essential change or improvement in the situation up to 1985. Whether the situation will improve for certain raw materials, as is expected in the case of phosphates and natural gas (offshore deposits), it is not yet possible to say anything definite at present. This might be expected only around the year 1985 or thereafter.

The share of domestic raw materials is proportionately larger in the case of metallic and biological raw materials, but the possibilities for development of chemical production based on metallic and biological raw materials are limited. On a world scale these two groups of raw materials had a share of only 6.5 percent in 1975. Their share will decline as a consequence of the ever more pronounced tendencies for biological raw materials to be replaced by synthetics. We also note the same thing in certain chemical derivatives of metals, where certain metal-base additives are also being replaced today by synthetics. This needs to be said since one sometimes hears the opinion that the chemical industry should be oriented toward these two groups of raw materials since the domestic raw materials base exists for them. Certainly there is a certain potential here, but as for the entire scope of the chemical industry, those possibilities are small and altogether limited.

The notion that the main flows in development of the chemical industry can be oriented along this path is fundamentally mistaken and is an error which can be supported only by someone who is not familiar with the present-day directions in the chemical industry's development.

Chemical production greatly increases the value of matter, especially when it passes through several conversion steps. This constitutes the principal economic interest in developing the chemical industry. Its economics is little affected by the origin of the raw materials, but is influenced rather by the extent to which technology is up to date, by efficient construction, by high utilization of capacity, by high yields, by labor productivity and by product quality. Countries with an advanced industry and well-trained personnel have the most efficient chemical industry.

We should also mention that certain raw materials can be purchased in a limited number of countries which have an abundance of them and export them. Long-term arrangements should be concluded with those countries, and in some cases capital should be invested to develop their raw materials base. The purchase of several million tons of raw materials for the chemical industry cannot be dealt with on a short-term basis, nor can this quantity be ensured unless a systematic and far-sighted approach is taken.

All the opportunities offered by the domestic raw materials base should be utilized, and we should strive to utilize it better and more completely. The situation

can be improved somewhat in this respect, but imports of large amounts will be a necessity since our country does not have enough of certain raw materials or lacks them altogether.

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